OPHTHALMIC NURSING

SYDNEY STEPHENSON

THIRD EDITION

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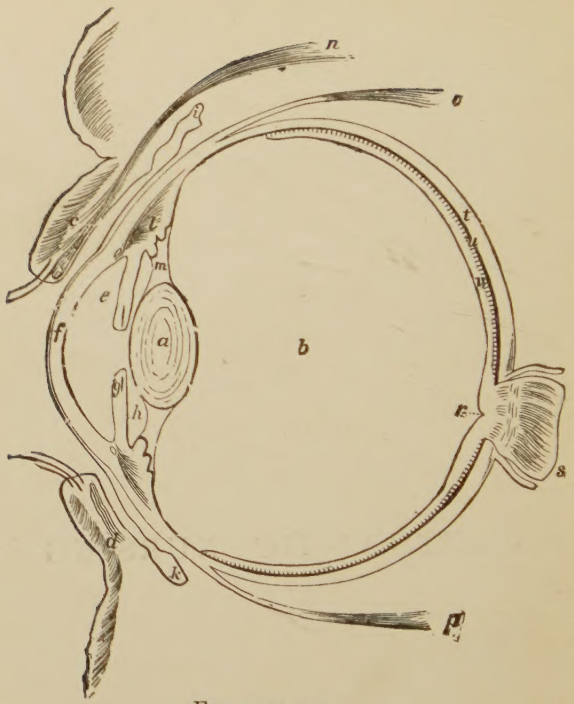

FRONTISPIECE.

VERTICAL SECTION OF THE EYEBALL AND EYELIDS (SCHEMATIC).

a Crystalline lens.
b Vitreous chamber containing the vitreous humour.
c The upper and *d* the lower eyelid.
e Anterior chamber filled with aqueous humour.
f Cornea.
g Iris.
h Posterior chamber.
i The upper and *k* the lower cul-de-sac of the conjunctiva.
l The ciliary muscle.
m The suspensory ligament.
n Section of the levator palpebræ superioris muscle.
o Section of the superior rectus muscle.
p Section of the inferior rectus muscle.
r The optic disc.
s Section of the optic nerve.
t Sclerotic coat.
u Choroid coat.
v Retina.

OPHTHALMIC NURSING

BY

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WITH EIGHTY ILLUSTRATIONS

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PREFACE TO THE FIRST EDITION.

This little volume is the outcome of instruction given to the nurses at the Ophthalmic School, Hanwell, W. That it may prove useful to a wider audience is rendered likely from the fact that there are upwards of forty special ophthalmic institutions in Great Britain, besides the eye departments of the general hospitals. Moreover, as yet no book has been written on the subject of which it treats.

My thanks are due to Mr. David Walsh for his painstaking revision of these sheets for the press, and also to Mr. John Griffith for the drawings that appear in the first chapter.

S. S.

33, Welbeck Street,
Cavendish Square, W.

PREFACE TO THE SECOND EDITION.

In the Second Edition of *Ophthalmic Nursing* I have made the alterations necessary to bring the text up to date, especially as regards new drugs and modern methods of sterilisation. I have also taken the opportunity of correcting several errors that had crept into the First Edition.

The increase in size of the book has been insignificant.

S. S.

August, 1902.

PREFACE TO THE THIRD EDITION.

The ten years that have elapsed since the appearance of a second edition of this little book have witnessed many changes in the methods of ophthalmic medicine and surgery. I have endeavoured to incorporate the more important of these in the new edition of *Ophthalmic Nursing*. My friend Dr. Ernest Thomson, of Glasgow, has been kind enough to read over the sheets for the press.

S. S.

October, 1912.

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OPHTHALMIC NURSING.

CHAPTER I.

THE HUMAN EYE; ITS STRUCTURE AND ACTION.

THE human eye, as every one knows, is a rounded globe, about an inch through in all its cross measurements. Its outer envelope is made up of several layers, which will be described later on. Its interior is divided into two main cavities, the ANTERIOR and the VITREOUS CHAMBERS, while between them runs a narrow space, known as the POSTERIOR CHAMBER (*see Frontispiece*).

The ANTERIOR CHAMBER roughly resembles in shape the space between the glass and the face of a watch. It is filled with a transparent watery fluid, the AQUEOUS HUMOUR, that can be drawn off by a puncture, as by the prick of a needle. Its watch-glass cover, so to speak, is formed by the clear CORNEA, while the face of the watch is represented by an opaque structure, the iris, and a transparent one, the CRYSTALLINE LENS. Of the two latter, the IRIS is the coloured part of the eye seen from the outside, having in its centre the round dark pupil or "apple" of the eye, which is really that part of the lens left

uncovered by the iris. Between the back of the iris and the lens is the POSTERIOR CHAMBER, a narrow space communicating through the pupil with the anterior chamber, and, like it, filled with AQUEOUS HUMOUR.

The VITREOUS CHAMBER occupies by far the greater part of the eyeball. It is designed on much the same lines as a photographic camera—that is to say, a darkened box into which light is admitted through a glass lens. The vitreous chamber is a cavity, fitted in front with a lens of clear crystalline material, and the amount of light allowed to enter into its interior is regulated by the iris. When a photographer wishes to admit more or less light into his camera, he places a disc with a larger or smaller central hole behind his lens. In the human eye, however, the exclusion or admission of light is effected by the iris, which is a kind of elastic curtain, made up of muscular fibres, and controlled by nerves. It is impossible to contract or expand the iris at will; but let any one place his hand for a few seconds over a healthy eye, and then expose the eye to a bright light. He will find that the iris contracts sharply on exposure, and, contrariwise, that it expands in the dark, actions which are involuntary, or beyond the control of the will. Returning to the camera, we note that it is blackened inside, and so too is the cavity of the vitreous, which is really a dark chamber filled with a transparent jelly-like material, the vitreous body or humour.

The aim of the photographer is to throw a small but distinct image on the back of his camera, where it falls on a glass plate covered with a thin chemical

film, which records the picture. To obtain a good picture the image must be exactly "focussed" on the sensitive plate. In the eye an image is brought to a focus not by the crystalline lens alone, but by the help of all the other transparent media through which light passes. These media are, from before backwards, cornea, aqueous humour, lens, and vitreous humour. We then come to the part of the eye corresponding to the sensitive plate, namely, the inner lining of the vitreous cavity, or RETINA, composed of the delicate endings of the optic nerve, on which rays of light are focussed to form an image.

Should any of these media become opaque, it is plain that the rays of light which convey the image will not be able to reach the sensitive plate of the retina. This is precisely what happens when the cornea grows milky, like ground glass, from inflammatory changes; when from some cause or other, the anterior chamber becomes filled with matter or with blood; when the lens is clouded by the haze of cataract; or when the vitreous cavity is filled with blood. The first essential, then, of perfect vision is that all the media should be transparent; but there is a second, not less important, namely, that the rays of light must be clearly focussed on the retina. Bad sight is often due to a faulty shape of the globe. For instance, in short-sighted persons, the eyeball is too long, so that the focus of objects falls short of the retina, while in long-sighted individuals the eyeball is shorter than it should be, with the result that objects are focussed beyond the

retina. In either case, a blurred image falls upon the sensitive membrane.

The impression of a focussed image is conveyed by the optic nerve to the brain, where it is recognised by the higher intellectual faculties residing in that organ. The optic is a special sensory nerve, whose endings are acted on chiefly by light; but at the same time one should bear in mind that other stimuli, such as blows or electrical shocks, are capable of giving rise to a sensation of light. So far as we know, the rest of the sensory nerves, whether of ordinary touch, or of special sensation, as taste, smell, or hearing, are not affected by light. The optic nerve, among its other duties, is supposed to carry a special stimulus to that part of the brain which regulates the aperture of the iris. A bright light stimulates the retina, and the sensation is carried by the optic nerve to a particular brain centre, from which a motor nerve leading to the iris is set in action, and the circular portion of that muscle contracts and thereby lessens the size of the pupil. This is known as a "reflex" or "sentinel" action, another familiar example of which, also performed through the medium of the optic nerve, is the closing of the lids when a person is threatened by a sudden movement. Suppose the stimulus of light to be prevented from reaching the brain by disease of the optic nerve, then exposure to light no longer causes contraction of the pupil, which accordingly falls into a motionless or fixed condition.

On looking into the healthy eye from the front,

one sees practically the whole of the anterior chamber through the clear cornea. The pupil appears black, just as does the lens of a camera from the outside. Supposing now, by means of the perforated mirror of an ophthalmoscope, we throw a light into and examine the interior of the eye, a picture will be obtained like that shown in Figure 1. The entrance

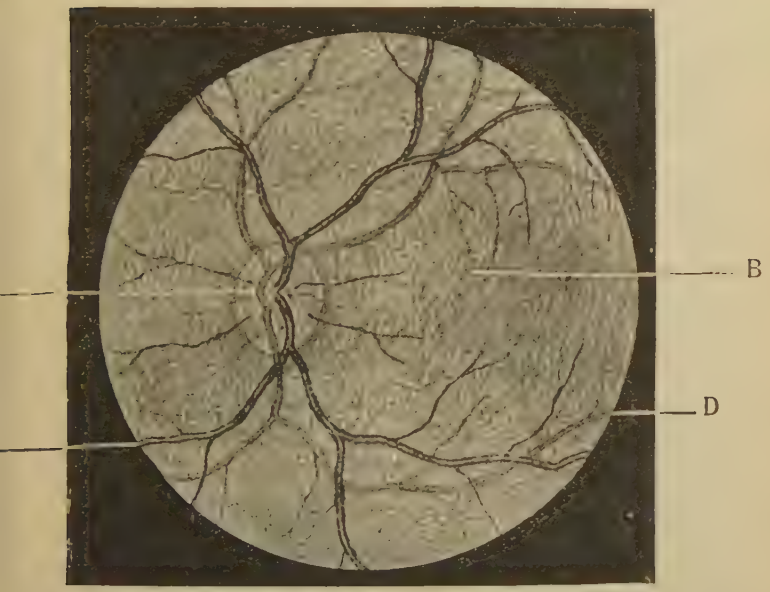

FIG. 1. "FUNDUS" OR "BACKGROUND" OF THE EYE, AS SEEN WITH THE OPHTHALMOSCOPE.

A The entrance of the optic nerve, the so-called "optic disc".
B The "yellow spot".
C One of the veins of the retina.
D One of the arteries of the retina.

(Note that the arteries of the retina are smaller in size and lighter in colour than the veins.)

of the nerve (A) appears as a pinkish rounded spot, the OPTIC DISC, from the centre of which blood-vessels are seen running upwards and downwards on what, examined in this way, looks like a red background. It is interesting to note that this is the only instance in the whole body in which a nerve, an artery, and a vein are open to direct inspection.

The eyeball is moved in various directions by muscles, of which two are oblique, and four straight. Of the straight or "recti" muscles, one is above, one below, and one on each side. The external rectus has a separate nerve, so that it is sometimes paralysed by itself, in which case the unaffected inner muscle pulls the eyeball inwards and an internal squint is brought about. The upper lid is lifted by a special muscle, and should this become paralysed, drooping of the lid, or "ptosis," results. The eyelids are surrounded by a thin flat muscle, the ORBICULARIS. The inner part of this muscle is concerned in winking, while the whole muscle is thrown into action when the eyelids are tightly closed.

The orbit is a large and deep cavity in the skull, in which the eyeball is tethered by its muscles and by the optic nerve. It is a bony case of immense strength, and forms a secure shelter for the delicate structures of the eyeball. Its roof is formed by a thin plate of bone, sometimes perforated by the thrust of a weapon, such as a foil or a walking stick. On the solid bosses of bone which form the projecting rim of the orbit the force of many a blow is spent, and, indeed, were it not so, every bout of fisticuffs

would almost certainly involve the destruction of one or more eyeballs. A further safeguard against the dangers of jarring is afforded by the packing of fat, glands, and loose cellular tissue, which fills up the large space left between the eyeball and the walls of the orbit.

The eyebrow is a fringe of coarse hairs running along the overhanging ridge of the orbit. Its use is to prevent sweat or moisture from trickling down into the eyes. It is a structure of more importance in the lower animals, as in the cat, where the long and sensitive hairs enable their owner to feel his way along in the dark. As age advances, the hairs in the human eyebrow often grow large, and resemble the "vibrissæ," as they are called, of the lower animals.

The lids are upper and lower, and their function is mainly that of protection. In the movements of opening and closing the eye, the upper lid is chiefly concerned. The orbicularis draws both lids together, while the upper one is raised by the LEVATOR PALPEBRÆ SUPERIORIS, and the lower one falls by its own weight. A third eyelid is present in some animals, as in birds, reptiles, and some carnivora; and this is represented in man by a pink sickle-shaped fold at the inner corner of the eye. The lids are composed of dense connective tissue, covered on the outer side by delicate skin, and on the inner by a moist soft membrane, the conjunctiva. Embedded in the lids are a number of fine tubular glands, the MEIBOMIAN, the openings of which may be seen as a row of tiny dots near the free edge of each lid. These glands furnish a kind of greasy secretion, which renders the lids water-tight when they are brought together. The

secretion also prevents the tears from overflowing when the eye is opened; and it assists the lid, moreover, in the important wiping or cleansing function it exercises on the globe.

Just along the edge of each eyelid is the fringe of hairs known as the lashes, which serve to shade the eye and to keep off dust and moisture, as well as to warn the eye of coming mischief. The lashes are very sensitive, and a slight touch is followed by an instant reflex closure of the lids.

The CONJUNCTIVA is continuous with the skin over the edges of the lids. It lines the inner surface of the lids, to which it is firmly attached, and passes in front of the eyeball up to the cornea, over which it is continued in the form of a thin and extremely delicate pellicle of epithelial cells. It is divided into two portions, that of the globe (*ocular conjunctiva*) and that of the lids (*palpebral conjunctiva*), which are connected together by two hollow folds, called the retrotarsal folds, forming the UPPER and the LOWER CULS-DE-SAC. The conjunctiva is a transparent membrance, and therefore appears white on the sclerotic, and pink over the eyelids. Its smaller blood-vessels are invisible in health, but when inflamed they enlarge, and become gorged with blood, so that the white of the eye turns to a cherry red, or, in common phrase, is "bloodshot". The ocular conjunctiva is so loosely attached to the underlying parts that it may readily be picked up with forceps, as the nurse will see any day for herself in the operating theatre.

The upper palpebral conjunctiva may be inspected by turning up the lid in a manner to be afterwards described; and then one sees (*a*) the smooth and delicate conjunctiva, which in health is glistening

and traversed by a few scattered blood-vessels; (*b*) the underlying Meibomian glands as faint bluish lines running from the free edge of the lids; (*c*) the pouting mouths of the Meibomian glands; (*d*) the pin-hole opening of the upper punctum lacrymale. When the lid is thus everted, there is still an unseen portion, or *cul-de-sac* (blind alley), running upwards and backwards between the globe and the lid. A similar, though much smaller, hollow dips beneath the lower portion of the globe. In both culs-de-sac the conjunctiva is loose, so that any movement of the eyeball pulls on the cul-de-sac and not on the lid. By this arrangement, the lids and the globe are able to move independently of each other.

The tears are secreted by a special gland, the lacrymal, which is packed away beneath the upper lid at the upper and outer angle of the orbit (*f*, Fig. 2). The secretion is salt and watery, and is constantly flowing in small quantity, by which means the eye is kept moist, and the lids are enabled to glide easily upon the eyeball. The gland opens into the upper cul-de-sac by several

FIG. 2. DIAGRAM OF TEAR APPARATUS.

a Lacrymal sac.
b and *c* The upper and the lower canaliculi.
d Nasal duct.
e Shows the outline of the orbit.
f Lacrymal gland.
g Ducts of the lacrymal gland.

minute ducts (*g*, Fig. 2), and under ordinary circumstances the greater part of the secreted fluid evaporates from the surface of the eyeball. On looking carefully at the edges of the lids, two small spots may be seen about a quarter of an inch from their inner ends, each having a pin-hole perforation. These PUNCTA LACRYMALIA, as they are called, open into two fine passages, the CANALICULI or lacrymal canals (*b* and *c*, Fig. 2), which in turn lead to a membranous bag, the LACRYMAL SAC (*a*, Fig. 2), and, lastly, the NASAL DUCT (*d*, Fig. 2) runs from the LACRYMAL SAC into the lower portion of the nasal cavity. The apparatus thus described serves to drain off the ordinary secretion; but when tears are secreted faster than they can be thus carried off, they overflow and run down the cheeks. Again, if there be an obstruction in any part of the conducting passages, such as a stricture in canaliculi, in sac, or in nasal duct, the tears overflow, and we get the condition known as EPIPHORA. The communication of the tear passages with the nostrils accounts for the fact that a person who is crying uses the handkerchief to the nose as well as to the eyes.

The ordinary convex lens is a transparent piece of glass, which has the power of bending rays of light passing through it, so that they are brought to a point or "focus". Its shape is that of a lentil seed (hence the name), or of the sweetmeat sold by confectioners as the "acid drop". Its action may be shown in a darkened room by placing a lens between a lighted candle and the wall. As soon as the lens is at the exact distance required to focus the candle,

an inverted image of the latter object will be seen upon the wall. If now the candle be moved away, the image on the wall will become dim and indistinct, but by putting a flatter, that is, a less convex, lens in place of the first, a well-defined picture can again be obtained. On bringing the candle nearer this flatter lens, the image will once more be thrown out of focus, but a clear picture is in this case obtainable by substituting a thicker or more convex lens.

In the foregoing experiment the candle alone has been moved, whereas the lens has been kept at the same distance from the wall. It shows that when an object is further off a flatter lens is needed to procure a clearly defined picture; and, on the other hand, the nearer the object, the thicker is the lens required to produce the desired effect.

Something of a similar kind happens in the human eye, which is so constructed as to focus distant objects without effort. The crystalline lens remains at a fixed distance from the retina, and instead of changing the position of the lens in order to define near objects, its shape is altered by a process known as "accommodation".

The crystalline lens is elastic, and is held in its position by a strong but delicate suspensory ligament. When this ligament is loosened, the front part of the surface of the lens bulges out, as it were, by virtue of its own elasticity, and is then by its rounder shape, that is, its greater convexity, adapted for the focussing of near objects. The nearer the object is to the eye, the rounder does the lens become. On the other hand, when the ligament is tightened, the

crystalline lens is squeezed into a flatter shape, and is thus enabled to throw a clear image of distant objects upon the retina.

Although this action of bending or refracting rays to a focus is mainly due to the crystalline lens, yet it is aided by the other transparent portions of the eye through which the rays of light pass to reach the retina. As noted before, these additional structures are the cornea and the aqueous and the vitreous humours. That they have in themselves some power of focussing is shown by the fact that after removal of an opaque lens, as in the ordinary operation for cataract, the patient still retains a fair amount of vision. For instance, he sees a door, but cannot recognise its panels without convex glasses to replace the lost crystalline lens.

A vertical section of the eyeball, as in the Frontispiece, shows some structures not yet described. The main wall of the vitreous chamber is composed of three coats, namely, the sclerotic, the choroid, and the retina, from without inwards. The SCLEROTIC is the thickest of these three coats; it is tough, white, and opaque, and is continuous in front with the clear cornea. The CHOROID is a thin dark coat that lines the sclerotic, and resting on the inside of the choroid is the delicate retina. The RETINA is the sensory expansion of the optic nerve, and occupies the hindmost two-thirds of the vitreous chamber. It is an extremely delicate membrane, about the $\frac{1}{100}$th of an inch in thickness, and under the microscope is seen to be made up of several layers. Next to the vitreous

is a covering of fine optic nerve fibres, ending in the layer of rods and cones (Fig. 3), which is more or less embedded in the pigmented layer of the retina, especially when the eye has been exposed to light. The optic nerve pierces the back of the eyeball, not exactly in the centre of the globe, but rather towards the inner or nasal side (Fig. I.). The central spot

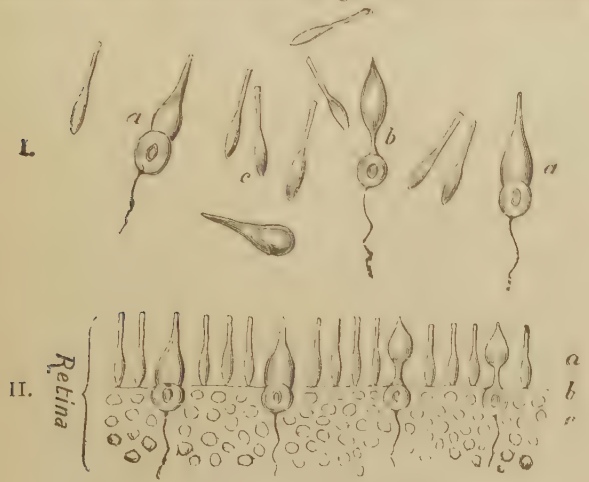

FIG. 3. RODS AND CONES.

I. *a* Retracted or sessile cone.
b Protruding or pedunculated cone.
c Rods.

II. *a* Rods and cones.
b Membrana limitans externa.
c External nuclear layer.

itself is marked by a small depression; it is known on account of its colour as the yellow spot, or *macula lutea* (Fig. I.). At this point, vision is most acute, and under the microscope it is found that there the innermost layers of the retina are thinned and

almost altogether absent, while the macula itself is made up almost entirely of cones.

The rods and cones are the only part of the retina acted upon by light.[1] For instance, the layer of optic nerve fibres next the vitreous has no perception whatever of light; it is in point of fact blind, and merely conducts impressions on their road to the brain. The optic nerve at the place of its entrance into the eyeball is also blind, a fact which may be demonstrated by the famous experiment of Mariotte.

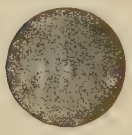

Fig. 4.

Holding this page about twelve inches from the eyes, look steadily at the cross with the left eye, keeping at the same time the right eye closed. Next bring the book nearer the face, and the circle will disappear at a certain point, to reappear again as the paper is brought still nearer the face. The experiment may be varied by closing the left eye, and looking at the circle with the right, when the cross will disappear.

The suspensory ligament of the lens arises from the inner surface of the ciliary body. Between the ligament and the iris is what is known as the CILIARY BODY and the CILIARY MUSCLE. The latter is composed of unstriped muscular fibres spreading out star-fashion from the back of the iris upon the choroid.

[1] Light, strictly speaking, does give rise to some other changes in the retina, as movements in the pigmented cells, bleaching of the visual purple, and, lastly, electrical alterations.

Its action is to draw forward the choroid, by which means the suspensory ligament is loosened, and the elastic lens swells out, so that its shape is altered or accommodated for focussing near objects. The ciliary muscle is thus the important structure by which accommodation is effected, and, contrary to the general rule as regards unstriped muscle, it is to a large extent under the control of the will.

The action of accommodation can be shown in the following simple way.— Let the observer look through a window at a distant object, say, a church, and he will be unable to see any flaws that may exist upon the window pane. Let him next look at something on the pane, such as a name scratched with a diamond, and he will be no longer able to distinguish the church clearly. He will feel a sense of muscular effort. The shape of the lens is altered considerably or accommodated in each instance; and another person looking sideways into the observer's eye would be able to see the iris actually bulged forwards by the rounding of the lens when the gaze was shifted from the church to the window pane.

Wonderful instrument though it be, the human eye is by no means without errors. Owing to imperfect accommodation we often form incorrect ideas about objects outside our eyes ("irradiation"), impressions which are rendered still more false because the media of the eye are not absolutely transparent. Instances of this are numerous. Thus, black clothes make the wearer appear smaller than he really is, a fact that is constantly taken advantage of by stout

people; again, white letters on a black ground, as advertisers know, look larger than black letters on a white ground. If we take the following simple figures we shall see there is an apparent difference in size in the length of the horizontal lines in (*a*) and in (*b*), whereas the appended measurements show them to be exactly equal.

FIG. 5.

The reader will now understand why the eye has been compared with a camera. In either case, the design is to throw a clear image of an outside object upon a sensitive plate at the back of a dark chamber. The photographer regulates the amount of light he wishes to enter his apparatus by placing diaphragms of various sizes in the aperture of his camera; but this is effected in the eye by a single contracting or expanding body, the iris. The operator adjusts his focus by sliding the lens nearer to or further from his sensitive plate. The crystalline lens, however, has a much finer mechanism, by which the shape of the lens itself is altered, a single lens thus answering all the purposes of near and of distant vision. There the simile ends; for the photographic picture is fixed on the glass by suitable chemical processes, whereas the picture focussed on the rods and cones of the retina is conveyed to the brain, where its meaning and message are interpreted by the reasoning faculty.

The retina has the power of recognising different colours. If the eye be fixed steadily for a few moments, say, upon a red Maltese cross printed on white paper, and then the gaze be turned to the ceiling, a green cross will be seen in the latter position. This is because the particular part of the retina which received the original picture of the cross has become exhausted for red light, and it is replaced for the time being by the remaining colours that make up white light. Some people are naturally blind to one or more colours; for instance, they may be red-blind or green-blind, or more rarely violet-blind. In most cases, this defect causes so little inconvenience that it may not be even suspected; but where it occurs amongst men who have to interpret colour signals as part of their duty, it may lead to very serious consequences. There is evidence to show that some otherwise mysterious collisions between railway trains and between ships may be accounted for in this way.

CHAPTER II.

THE GERM THEORY OF DISEASE.

Of late years almost all our great advances in medicine have depended upon our better knowledge of germs and their relation to disease. Since the discovery of the *bacillus* of the silkworm scourge by Pasteur, the origin of many other maladies, both in man and in the lower animals, has been traced to micro-organisms.

Pasteur's earlier researches proved that fermentation was due to the presence of a special yeast fungus. He showed that this minute organism flourished in certain fluids, where it set up a series of definite chemical changes, and that its cells exhibited the three great vital phenomena of nutrition, growth, and reproduction.

A typical yeast cell—for there are many varieties—is oval or rounded in shape, and about $\frac{1}{3200}$th of an inch in length—that is to say, the same size as a red blood corpuscle. For its development and active life it requires water, warmth, and oxygen, besides certain substances which serve as food. It never originates spontaneously in a fluid, but always springs from a pre-existing yeast cell. By its growth in a solution of one or more particular kinds of sugar it splits up the latter into alcohol and carbonic acid gas,

the latter of which appears as a froth. Further, drying does not destroy the vitality of the yeast, so that a dried fragment is capable of starting into active life if added to another sugar solution, where it goes on flourishing and reproducing its kind so long as any sugar is left. If boiled, however, it is killed once and for all, and a similar thing happens if it be exposed to the action of certain chemical substances, such as carbolic or salicylic acid of sufficient strength. Drugs which possess this power of destroying germs or micro-organisms are called "antiseptics" or "germicides".

From the foregoing sketch one may gather some of the chief facts regarding micro-organisms and their mode of action. One sees that this minute vegetable cell thrives and multiplies under favourable surroundings as to food, warmth, and moisture; that it springs from pre-existing cells of the same species, and reproduces its like; that it has a definite life history, in the course of which it decomposes the surrounding material which acts as its food; that it manufactures fresh chemical products of an entirely different kind; and, lastly, that the fungus, within certain limits, is capable of great vitality, but at the same time may be destroyed by boiling and by chemical antiseptics.

All micro-organisms, however, do not act in the same way as the yeast plant; in fact, they vary as much amongst themselves as common garden plants and vegetables. Thus, they differ in their shape, in the way of reproduction, in the food they require, in their *habitat*, and in the chemical products to which

they give rise. Some of them cannot live without oxygen, while others demand carbonic acid; some can exist only in dead matter (*saprophytes*), and others only in living tissues (*parasites*).

Suppose we take some ordinary mutton broth and leave it exposed to the air in an uncorked flask. We know that in a few days it will acquire a bad taste and smell, or, in other words, it will have become spoilt. This change is caused by certain germs that have gained access from the air and have set up chemical processes akin to fermentation, but differing in their products, and known as putrefaction. If now we inject a sufficient dose of this stinking broth beneath the skin of a guinea pig, the animal will sicken and die. Something of the same kind happens in many of the diseased processes that take place in the human body. When an abscess, for instance, becomes foul and evil-smelling, it means that micro-organisms have gained an entrance into the abscess cavity and set up putrefaction. Some of the poisonous products of putrefaction may be absorbed into the body, and lead to a long and lingering illness (*blood-poisoning*), or even kill the patient.

Fermentation and putrefaction, then, are always due to the presence of micro-organisms. Broadly speaking, these fungi are the simplest forms of vegetable life; plants without leaves, branches, roots, flowers, or colouring matter (chlorophyll). Moreover, they live on pre-formed substances, as sugar or albumen, and do not build up their food from air,

water, and soil, as is the case in the higher plants. The germs or spores of these organisms, which we may compare with the seeds of plants, are found everywhere in nature, in the air, in the earth, and in the waters beneath the earth. Indeed, we know that very many of the operations of nature, such as the decay of vegetation and the fertilisation of soils, are carried on by means of these tiny micro-organisms. If we expose a tumbler of milk over-night in warm weather, it will probably be sour in the morning, because of the invasion of a peculiar fungus, the *oidium lactis*, which has changed the sugar of the milk into lactic acid.

Putrefaction cannot go on without these minute plant cells; and the prevention of that process in wounds by the exclusion of micro-organisms or their germs (spores) is the broad underlying principle of aseptic surgery. To exclude parasites from entering the body in other ways is the aim of preventive medicine.

Let us boil some mutton broth in another flask and put a plug of wool in the neck of the vessel. The broth may now be kept for weeks or months without undergoing any visible change. In this case we first destroy by boiling all the organisms or spores that may happen to be in the broth, and we prevent the access of fresh ones from the air by the plug of wool, which acts as an efficient filter. Similarly, by adding a sufficient quantity of some antiseptic, such as corrosive sublimate, we shall destroy all fungi that may be present, and the flask may be then sealed and put away for years and years without any

putrefactive changes taking place in the broth. In surgery we purify a wound by antiseptics and by other means, and then guard against the entrance of germs by suitable dressings which act both as filters and as destroyers of germs (*germicides*). Aseptic surgery, on the other hand, aims at excluding

FIG. 6.

a Simple round cells, or cocci.
b Diplo-cocci.
c Chains of cocci, or strepto-cocci.
d Bacilli arranged in threads, or leptothrix, from human mouth.
e and *f* Bacilli.
g Mould fungus.
h Cork-screw forms, or spirilla.
i Packet-forms, or sarcinæ.
k Yeast fungus.
m Tubercle bacilli lying inside a giant-cell.

septic organisms by the most scrupulous cleanliness as regards all and every surrounding of a surgical wound.

Micro-organisms are of various shapes (Fig. 6). They may be simple round cells (cocci) arranged in pairs (diplo-cocci), in fours, in chains (strepto-cocci), or in colonies (staphylococci), or they may be rods,

straight, curved, oval, spiral, comma, and other shapes variously grouped in chains and in colonies. They are all extremely small, as may be judged from the fact that one of the largest, the bacillus of anthrax (cattle plague), measures only $\frac{1}{5000}$th of an inch in length. Indeed, the organisms concerned in the production of parasitic disease are so small that it is no exaggeration to say that some thousands of them might dance on the point of an ordinary needle. It has been estimated by Professor Bottomley that 25,000,000 of them could be placed upon an ordinary postage stamp without overcrowding.

The difficulty of studying the life history and habits of such tiny bodies may be readily imagined.

Bacteria, the most important species of the disease-producing fungi, may be reproduced either by simple splitting or by the internal formation of spores. These spores, as already stated, may be compared with the seeds of higher plants, and the fact should be noted that they are often of far greater vitality than the fully formed bacteria. *Spores are therefore often able to resist the action of heat or of antiseptics that would readily destroy the parent organisms.*

The products of bacteria are very various; but among the most important, so far as the human body is concerned, are the ptomaines, or "toxines" as they are sometimes called. These ptomaines are the products of decomposition; they are usually very poisonous, and may be compared with the alkaloidal poisons, such as strychnine, which are found in higher vegetable life, and which are fatal in minute doses. In many parasitic diseases the main part of the mischief is due to ptomaine poisoning. For example, typhoid fever is caused by a bacillus that infests the

lower bowel, where it causes a large amount of inflammation and ulceration. The rise of temperature, the muscular pains, the prostration, the loss of appetite and other symptoms are, however, probably due to the absorption into the system of ptomaines excreted by the typhoid bacilli. So in lung consumption, we find the local centres of inflammation or "tubercles"; but many of the characteristic symptoms, such as the continuous raised temperature, the thirst and emaciation, are to a great extent caused by poisoning from the products of the tubercle bacilli. The general symptoms of diphtheria, again, are mainly due, not to the micro-organism of that disease, but to the products it throws off into the patient's system.

Koch, whose name has been made famous by his work in bacteriology, as the study of these minute fungi is called, began by perfecting his microscope. He also devised new methods of staining micro-organisms, whereby they were more readily to be distinguished in the tissues. His greatest step, however, was the discovery that bacteria could be grown in suitable material, or "media" (*sing.* "medium"), outside the body. In this way many micro-organisms can be cultivated on solid media in a test-tube almost as readily as we grow radishes or mushrooms in a frame. Tubercle bacilli planted in tubes of nutrient blood-serum properly sterilized (that is, freed from other organisms), and kept at the requisite degree of warmth for three or four weeks in a small oven or "incubator," will thrive and flourish. In this way

they have been handed on from tube to tube through many generations, with a continuous descent extending over several years.

When obtained artificially in this manner a "pure culture," or colony composed of one kind of organism only, has its own peculiar method of growth. Thus in Figure 7 three colonies are shown, each of

Fig. 7.

which has its own shape and colour, as it grows downwards into the gelatine, agar, or other medium.

The last link in the chain of proof is to test the pure culture by injecting some of it beneath the skin of an animal which is known to be susceptible to the action of that particular organism, and noting whether the original disease be reproduced. For instance, the guinea pig is especially subject to tuberculosis, and when inoculated with the bacilli of that disease, tubercles are formed in the lungs, lymphatic glands, and other parts of its body. The animal usually dies from tuberculosis in the course of a few weeks.

Other media are in use besides gelatine, amongst them being various fluid and solid materials—as, for

instance, broth, meat jellies, iceland moss, or the surface of a raw potato. Cultivation, however, cannot be applied to all organisms, for some of them refuse to grow in any medium or under any conditions hitherto discovered. Such are the bacillus of leprosy and the spirillum (spirochaete) of syphilis. Nevertheless, there can be little doubt that some day, as our methods of investigation become more perfect, we shall discover many bacteria that are now unknown, such as those of mumps and of measles. Amongst those already identified may be mentioned the organisms of anthrax, relapsing fever, typhoid, tuberculosis, cholera, erysipelas, glanders, and of the suppurative process generally. Suppuration is commonly believed to be the work of several fungi, among the most important of which are the *staphylococcus pyogenes aureus* and the *streptococcus pyogenes*. In the eye we can trace to definite organisms ophthalmia neonatorum and gonorrhœal ophthalmia (gonococcus), angular conjunctivitis (Morax-Axenfeld diplobacillus), diphtheritic conjunctivitis (Klebs-Löffler bacillus), lupus and tuberculosis of conjunctiva (tubercle bacilli), muco-purulent ophthalmia (Koch-Weeks' bacillus), abscess of cornea (pneumococci), and suppurative processes generally (pyococci). The presence of a specific organism in trachoma is still doubtful.

The eye affords a good vantage ground for the growth of micro-organisms. It supplies a warm, moist surface abundantly supplied with a watery fluid which contains various salts and a trace of albumen. Indeed, when we consider these favourable conditions, together with the exposed position of the eye, we may

well wonder that it is ever free from mischief due to the entrance of organisms. Mucous membranes, however, share with other healthy tissues a great power of resisting the attacks of bacteria. It has been shown that the white blood corpuscles have the remarkable faculty of taking into their interior, and, as many people suppose, of actually destroying bacteria (*phagocytosis*).

One point should be specially noted.—The presence of accumulated discharges in any part of the body is an open road to the invasion of micro-organisms. Pus, which is so much dead matter, furnishes an excellent nutrient medium, or food, for bacteria. Hence, it is a first rule in modern surgery to provide for the quick and constant removal of discharges either by drainage or in other ways. The eye may be cleared of matter by gently wiping the exposed conjunctiva with a piece of cotton wool. Syringing is open to the objection, as will be explained later (see p. 67), that it is somewhat dangerous to the person who applies it.

Antiseptics, if required to destroy bacteria, must be of a certain degree of strength. This fact presents a difficulty in treatment, for a strong antiseptic is usually irritating. Another obstacle arises from the minute nature of these organisms, which are easily shielded in the tissues, so that in many cases it is impossible to attack them directly with any antiseptic agent. If one could reach the bacilli in the lungs in a case of phthisis, there would be a reasonable hope of getting rid of the disease. No method,

however, has yet been devised of bringing any antiseptic into thorough contact with the tubercle bacilli, scattered as they are through every part of the air passages down to their finest terminations, and shielded by mucous and other secretions. At one time it was thought that the desired end might be attained by the inhalation of antiseptic vapours, but when put into practice, the method proved disappointing. Hence, we nowadays fall back upon the method of strengthening the organism to rid itself of the intruders either by compelling the patient to live in the fresh air or by injecting tuberculin into the system.

The ideal antiseptic, which shall destroy bacteria, and at the same time be unirritating, non-poisonous, and harmless to instruments, has not yet been discovered.

The nurse will now perceive how necessary it is to prevent the introduction of these minute particles of vegetable matter, or their no less dangerous spores, into the eye. She will recognise why it is of the utmost importance to consider and to guard against any and all of the hundred and one ways in which they may gain access to the cavity of the conjunctiva; why it is that the hands must be purified with antiseptics; why unclean towels and flannels and sponges are fertile agents of mischief; why eye-shades should be promptly destroyed in infectious cases; why instruments and appliances must be scrupulously cleansed. In a word, she will have the key, by an

intelligent knowledge of the relations of bacteria to disease, to many of the directions which are given in this book, and which without that clue might appear to be tedious and unnecessarily minute.

Antiseptics will be described under the section that deals with remedies generally. It is interesting to note that the virtues of many of the old-fashioned remedies may be traced to the antiseptics which entered into their composition. Friars' balsam (the compound tincture of benzoin), turpentine, lunar caustic, and tincture of iodine are familiar cases in point.

CHAPTER III.

CONTAGION AND INFECTION.—CONTAGIOUS EYE DISEASES.—AVOIDANCE OF CONTAGION: (*a*) ON PART OF PATIENTS, (*b*) ON PART OF NURSES.—TOWELS.—WASHING ARRANGEMENTS.—RULES.

CERTAIN diseases of the eye are contagious; that is to say, they may be communicated from the sick to the healthy, and are commonly said to be "catching". They are due to micro-organisms, which may reach the eye in a direct or an indirect manner. Contagion is direct when a particle of septic discharge is planted, so to speak, in a healthy eye, as happens when the diphtheritic virus is coughed into the eye of a nurse by a patient suffering from diphtheria. Contagion is indirect, on the other hand, when the infecting material is conveyed by means of some intermediate agency, such as water, sponges, or towels. Another example of indirect contagion is when a patient transfers matter from his diseased to his healthy eye by means of a finger.

It has been assumed that, under certain circumstances, a *contagious* eye disease may become *infectious;* in other words, that it may spread through the medium of the air. Particles of the dried discharge, it is supposed, float about in the atmosphere as dust, and these, coming into contact with sound

eyes, communicate the original disease. Something of a similar kind certainly happens in the case of measles, influenza, scarlet fever, and other highly infectious diseases. One cannot, of course, deny the possibility of a similar occurrence in eye diseases, but it could probably come about only under the influence of bad surroundings or of gross mismanagement, such as neglect of treatment, overcrowding, dirty clothes, unwashed bedding, or the herding together of diseased and healthy persons in one room.

At the Ophthalmic School at Hanwell, W., which received every kind of contagious ophthalmia, no instance of air-borne disease was ever observed. The institution, which had 350 beds, was occupied for upwards of thirteen years, yet not a single nurse out of a large staff contracted the disorder. None of the teachers, furthermore, who were necessarily brought into close contact with the patients, were infected. Lastly, no instance was met with in which ophthalmia was spread from child to child in any other way than by contagion—that is, by the direct transfer of morbific particles. Had the disease been capable of transmission through the air, it must surely, according to the law of averages, have attacked many individuals, who, although exposed, enjoyed complete immunity. The fact, too, is significant that all precautions taken were based upon the view that ophthalmia was spread by the conveyance, direct or indirect, of specific discharges from eye to eye.

The contagious eye diseases are those inflammations of the conjunctiva collectively known as "ophthalmia,"

and under this heading a number of different affections will be found grouped together. All forms, however, have one feature in common, namely, the presence of discharge from the eye. It is a good working rule to regard all discharges from an inflamed eye as contagious, and the more abundant the flow of matter, the greater are its contagious properties likely to be. The discharge varies in colour: sometimes it is white and slimy, like that from the nostrils during a "cold in the head"; and at other times it is yellow. The white discharge is called "mucus," and the yellow, "pus," while between the two are a number of intermediate varieties which may be styled "muco-purulent". The more a given discharge resembles pus in its appearance, the more virulent is it likely to be, from which statement it follows that the chances of contagion are increased with the presence of copious yellow matter.

The different forms of ophthalmia vary much in their degrees of contagiousness. The chronic form of conjunctivitis known as "trachoma" is contagious only under certain conditions. On the other hand, acute purulent ophthalmia, caused by the introduction of gonorrhœal matter into the eye, is highly contagious. The smallest particle of discharge from such an eye is sufficient to communicate the disease in its full activity. This fact can be easily explained now that both gonorrhœa and gonorrhœal ophthalmia have been proved to be due to a minute parasite, the gonococcus. The acute form of ophthalmia, again, which affects new-born infants (*Ophthalmia neona-*

torum) is markedly contagious, and may rapidly run through an entire household, unless proper precautions be taken to prevent its spread. Ophthalmia neonatorum is akin to gonorrhœal ophthalmia, and is caused, as will be explained later, by infection of the child's eyes during or more often immediately after its passage into the world. The gonococcus may be often demonstrated in the discharge. A third highly contagious form of disease is found in diphtheritic inflammation of the conjunctiva. Fortunately, severe cases of this formidable affection are somewhat rare in England, although common enough in many parts of Europe, as for instance in North Germany. It often occurs as an epidemic, and is caused by the virus of diphtheria gaining access to the eyes. In point of fact, it is simply a local form of the disease.

The following eye diseases, then, are contagious: trachoma, catarrhal ophthalmia, ophthalmia neonatorum, purulent ophthalmia, and diphtheritic conjunctivitis.

Let us now suppose that we have to deal with an adult patient suffering from acute purulent ophthalmia limited to the right eye. The discharge from such a case will be profuse and purulent, and, in the absence of proper safeguards, will almost certainly find its way over the bridge of the nose into the left eye. How shall we prevent inoculation of the left eye with the contagious discharge? Our patient being in bed, the first obvious precaution will be to make him lie on his right side, so that the matter may flow away from the sound eye. But this expedient

alone will not suffice to ensure the left eye against inoculation. Two plans are in vogue, either of which effectually shields the unaffected eye. By the first method, the lids of the sound eye are smeared with iodoform and vaseline (iodoform, one part; vaseline, eight parts), and are accurately covered with a disc of fine linen. A layer of antiseptic cotton-wool is placed over the linen, and a bandage is carefully applied. Finally, the eye is completely sealed up by placing morsels of cotton-wool saturated with collodion in any gaps that may remain between skin and bandage. This method, although thoroughly protective, has various drawbacks. In the first place, the eye becomes liable to a kind of superficial inflammation, and the dressing soon grows hot and uncomfortable; secondly, the eye is excluded from all exercise of vision; thirdly, the dressings must be changed every day. These disadvantages may be avoided by adopting the watch-glass and sticking-plaster shield introduced a good many years ago into ophthalmic practice by Dr. Buller.[1] The materials needed for the application of a "Buller's Shield," as it is sometimes called, are an ordinary watch-glass and some india-rubber

[1] Buller's original shield was constructed as follows: A watch-glass was fastened into the centre of a square piece of mackintosh, trimmed to fit the nose and the forehead of the patient. By means of three strips of adhesive plaster, the waterproof shield was then fastened to the nose and to the forehead. The lower and the outer side of the apparatus was left open, so that the eye was freely exposed to the air. The plaster was renewed whenever it became moist.

sticking-plaster. Two pieces of the plaster are taken, the one measuring about four and a quarter inches square, the other about four and three-quarter inches square, and a circular hole is cut in each. The larger piece of plaster is fixed to the bulging side of the watch-glass; the latter is then turned over, and the smaller piece of plaster fastened in a similar way on the hollow side. The watch-glass is thus placed between the two pieces of plaster, which are stuck together by their adhesive surfaces. To apply the shield, the overlapping adhesive margin of half an inch is carefully fastened to nose, forehead, temple, and cheek, but the lower part of the outer side is left open, so as to admit air (Fig. 8). The attachment to the side of the nose requires careful adjusting; and it may be necessary to add one or two extra strips of plaster in that situation. Buller's shield permits the patient to use the protected eye, while its free ventilation not only obviates inflammatory trouble, but also adds considerably to the comfort of the patient. It may be worn for several days without change, unless, as sometimes happens, the skin beneath the plaster becomes affected with a kind of

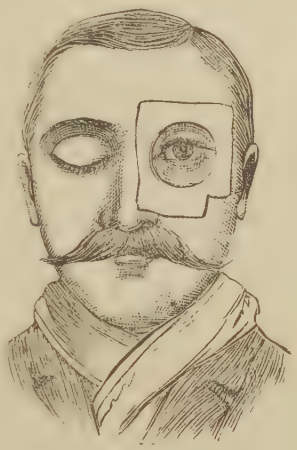

Fig. 8.

Buller's Shield.

eczema. In that case, a simpler form of protection must be substituted, and the irritable skin soothed with appropriate remedies.

Dr. Lucien Howe has recommended that the eye should be protected by a mica shield, accurately fitted to the brow, cheek, and nose by means of adhesive plaster.

So far we have been dealing with an adult patient, but the case is somewhat different with infants, in whom it is often a matter of considerable difficulty to keep any sort of appliance in place. Perhaps our best plan under these circumstances is to close the lids of the sound eye by means of a couple of strips of adhesive plaster, reaching from the upper lid well down the cheek. Over this we put a pad of cotton-wool, and cover in the whole with gutta-percha tissue, the edges of which are cemented to the skin of the nose, the forehead, and the cheek by the aid of a few drops of chloroform.

A decidedly inferior plan is to cover the sound eye with a pitch plaster, in the centre of which a *small* hole is cut for ventilation and for sight.

It is sometimes advisable to secure the infant's hands, so that he cannot inoculate himself with his own fingers.

The various utensils used in washing are every-day agents in the spread of contagion. In this way, towels, sponges, basins, and flannels are all sources of danger, when used in common by the healthy and by those affected with ophthalmia. A nurse should take care, therefore, that each patient

has his own set of washing utensils, and that under no circumstances does he use those belonging to other persons. In large poor-law schools, where the various forms of ophthalmia are often very prevalent, great importance is attached to this point. The children wash in running water, and the use of fixed basins is altogether prohibited. A similar principle is recognised with regard to baths, and two children are never permitted to use the same water. Indeed, some of the more modern establishments have replaced the "slipper" or plunge bath by what is termed a "spray bath". The latter consists of a slate case provided with a glass door, while the water is supplied by means of an iron service pipe with perforated nozzles. Directly a child steps into the bath, certain valves are opened by means of a spring, and the jets throw a fine spray over the whole body. In some schools a child is not allowed to use the same towel twice. More generally, however, each towel is marked with the number of the child's bed, and is changed daily or less frequently. At the same time the use of towels belonging to other children is prohibited under pain of punishment.

In dealing with contagious cases, sponges and washing flannels should be altogether discarded, and basins, if used at all, should be thoroughly disinfected after use. The better plan to follow in these cases is to make the patient wash in a stream of water running from a tap. A piece of tow may be used for the patient's face, and this material should be burnt immediately after use. The same rule of

immediate destruction applies to all dressings and other contaminated materials.

Handkerchiefs are a possible source of danger. If not done away with altogether, they should at least be stitched to the patient's clothing, so that they cannot be used by more than one person.

Contagious eye affections may of course be communicated to the nurse herself, and certain precautions should be taken against so unfortunate a result. All preventive measures centre around the fact, to which attention has been already drawn, that the essential element of contagion dwells in the discharge. "*No discharge, no contagion*" is an excellent maxim for those who deal with ophthalmia. It is probable that the fingers are the commonest carriers of contagion. They therefore require close attention. When called upon to take charge of a case of ophthalmia, the nurse should cut her nails closely, and should keep them short during the whole time she has to do with the case. After handling an eye, and before leaving the room, she should thoroughly wash and disinfect her hands with most scrupulous care. The use of the nail-brush, especially, must never be omitted. For my own part, I attach more importance to the conscientious use of a nail-brush than to any of the so-called antiseptic soaps, so widely advertised in the present day. There is, however, no objection to the use of such soaps, provided their reputed virtues do not make the nurse careless of the more homely means of scrubbing. It is not a bad plan, when dealing with severe cases, to pack with hard soap the

little space that should remain beneath properly pared nails. Before drying, the hands should be immersed for ten or fifteen seconds at least in a solution of corrosive sublimate (1 in 1000). I would urge, however, at the risk of some repetition, that careful cleansing in the first instance is to be regarded as nine-tenths of the battle.

In removing discharge from an eye, it is well to wear a pair of protective goggles, so as to prevent any sudden spurt of matter from reaching the eye of the attendant, and for the same reason it is advisable to stand behind the patient.

Another way in which contagion may be conveyed is through taking an affected child into the arms for purposes of nursing. It will be well, therefore, for nurses to avoid any such practice when dealing with children suffering from ophthalmia.

The nurse's dress should be of some stuff that can be easily washed, and she should wear a large jaconet apron, which can be cleansed with antiseptics after each dressing. Sleeves should be close fitting and short at the wrist, while the latter should be protected with a linen cuff. As an additional precaution in cases where there is much discharge, a loose kind of sleeve may be worn, reaching from wrist to elbow, and made of green protective or jaconet. This sleeve can be easily slipped off and on, and should be disinfected before and after use in a one in twenty carbolic lotion.

In case matter reaches the nurse's eye, prompt action must be taken. The lids must be everted, and

the conjunctiva thoroughly flushed with 1 in 5000 corrosive sublimate solution. After that, one drop or more of a one per cent. silver nitrate solution should be placed over the exposed membrane, and cold applications should be used for some hours. These precautions, if carried out at once, will probably prevent further mischief.

The rules, then, which should be observed by a nurse in dealing with contagious eye disease may be summed up as follows:—

1st. Pare the nails closely. 2nd. Remove all applications with dressing forceps, and not with the fingers. 3rd. Make it a point to use the nail-brush diligently, and to wash and to disinfect the hands thoroughly before leaving the room. 4th. Never take an affected child into the arms if it can possibly be avoided. 5th. Stand behind the patient when using remedies, as this position is least exposed to the risk of accidental spurts of matter. 6th. Never use a syringe. 7th. Wear protective goggles, jaconet apron, and sleeve guards when attending the more virulent diseases, such as gonorrhœal or diphtheritic ophthalmia.

CHAPTER IV.

REMEDIES.

THE greater number of affections of the eye which the nurse will be called upon to treat are due to inflammation and its results. A few words may therefore be said regarding that process.

Acute inflammation is, so to speak, put in a nutshell by the four symptoms of the old writers—redness, heat, swelling, and pain. It may arise from a variety of causes, such as injury, the presence of foreign bodies, cold, new growths, irritant chemical substances, or micro-organisms. The process may end in the absorption of effusion (swelling) and recovery; it may go on to ulceration, to abscess, or to sloughing; or it may become chronic, in one form of which the effused material is slowly converted into new tissue. As pointed out by Sir Thomas Watson and other writers, nowhere can the process be more readily studied in its every stage than in the eye. An inflamed conjunctiva, for instance, is bloodshot, swollen, and painful; while a delicate thermometer, placed beneath the lid, would show the temperature to be raised.

The treatment of inflammation will be directed, in the first place, to removal of the cause, such as a foreign body or septic material (micro-organisms or

their products); while some constitutional ailment, as syphilis or rheumatism or tubercle, may require appropriate medicine. Symptoms must be treated as they arise; blood-vessels may be emptied by astringents or by blood-letting, and pain relieved by the use of anodynes.

Another important branch of treatment is the preventive: for instance, if one eye be suffering from a contagious complaint, it is in every way desirable to shield the other eye from infection. It is a first rule, again, that we must try to hinder all surface inflammations from spreading to deeper parts of the eye. A further preventive measure is to avoid the introduction of micro-organisms on hands, sponges, brushes, instruments, or anything else that approaches the eyes, a purification of surroundings which goes by the general name of "aseptic precaution".

We have, then, a large class of remedies, the most important of which are astringents, sedatives, and anodynes, concerned in the direct treatment of inflammation and its symptoms: a second class includes antiseptics, or substances that destroy micro-organisms: while a third class embraces irritants, depletives, and remedies of various actions.

Sterile water, and saline solution, and boric lotion are constantly called for in modern aseptic work. In a properly equipped hospital, there is no difficulty in this respect, since those places are provided with a steam water steriliser, but in private houses a nurse must devise some ready means of meeting the surgeon's demands. Now ordinary water from the main invariably contains micro-

organisms, some probably of a dangerous nature. These microbes (and the others) may be killed by the addition of chemical agents, as sublimate; by filtration through a clean Berkefeld candle; by the action of steam, as in a steam steriliser; and, lastly, by boiling. Of these various methods, boiling is at once the simplest and not the least efficacious. A brief exposure to the temperature of boiling water (212° F. or 100° C.) kills all disease-producing micro-organisms. The rule therefore is that, in order to secure sterility, water and the other liquids named above must be boiled for five minutes in a closed vessel, and must not be exposed to contamination after the process.

Something may be said here about absorbent cotton-wool, which is much used in eye work. A morsel of wadding floats when thrown into water, whereas a piece of absorbent wool similarly placed, sinks to the bottom of the vessel. Absorbent wool takes up water because the greasy matter of ordinary cotton-wool has been removed by treatment with soda and spirits of salt. Advantage is taken of the properties of the prepared wool to impregnate it with various antiseptics, such as boric acid, eucalyptus, iodoform, mercuro-zinc cyanide, or sal alembroth, although these antiseptic dressings are nothing like so popular nowadays as they were but a few years back.

Pads of absorbent wool and gauze are much used in the place of sponges. Gamgee tissue consists of a layer of absorbent wool, about half an inch in thickness, enclosed between two folds of unbleached gauze. A convenient eye-dressing can be made out of this

tissue, either plain or charged with one of the above-mentioned antiseptics, by cutting out a piece about three inches across and rounded at the corners.

A nurse will hear much of "normal saline solution" as a wash to the eyes. This is merely a solution of common salt (pure Sodium Chloride) of about 0·65 per cent. It is very bland, and causes neither irritation nor pain. Hence its popularity. It can be prepared extemporaneously by boiling a teaspoonful of pure salt in two pints of soft water. Saline solution will not keep indefinitely. It must, therefore, be prepared freshly for each operation, or at least be sterilised frequently by boiling or by steam under pressure, as in an autoclave.

Antiseptics.

Carbolic Acid, a most efficient antiseptic, is sometimes applied pure to the cornea to check the progress of an advancing ulcer.

Boric or Boracic Acid is an unirritating astringent, with slight antiseptic properties. It is extensively used as a lotion, in a strength of five to twenty grains to the ounce of water. The addition of an equal quantity of borax renders the acid more soluble, and at the same time adds to its effectiveness.

Hydrogen Peroxide, a clear solution with a bitter, acid taste, is a solution of hydrogen dioxide in water. It is most useful in quickly ridding an eye of purulent discharge, as in cases of ophthalmia neonatorum, so that it may be examined the better by the surgeon. When brought into contact with pus, a frothy effervescence is produced, owing to the escape

of the contained gas oxygen. Hydrogen peroxide is also employed as a styptic to stop bleeding, and as a means of removing surgical dressings that "stick" to the parts. Merck's "Perhydrol" is an improved form of hydrogen peroxide. Bottles containing these preparations must be kept tightly corked and inverted and away from the light.

Permanganate of Potash, better known in solution as "Condy's Fluid," makes an excellent antiseptic wash, especially in cases of ophthalmia neonatorum; but it is not used so much as it might be, probably because it has the drawback of staining linen. Its usual strength is 1 in 5000.

Iodoform, a yellow powder; a powerful antiseptic when applied to wounds. It has a strong distinctive odour, and is used as an ointment (one in twelve of vaseline), or is dusted over parts after operation. It is also prepared in discs with gelatine $\frac{1}{1000}$th of a grain in each, but these are seldom employed. It is sometimes dissolved in collodion, and painted over the lids. Another preparation is iodoform wool.

Iodol is a brown powder, free from smell, which acts like iodoform.

Sulphate of Copper ("bluestone"), although generally used for its other properties, is a powerful antiseptic.

Quinine, in lotion, three grains to the ounce of water, dissolved by the addition of one minim of diluted sulphuric acid. The hydrochloride salt dissolves in water without the aid of acid.

Mercury is a powerful antiseptic in many of its preparations, of which the following are the chief:—

Corrosive Sublimate, otherwise known as perchloride or bichloride of mercury, extensively used in weak lotions, one part in 4,000 to 10,000 parts of water; also in combination with ammonium in sal alembroth wool, coloured blue for the sake of distinction. It is a remedy of ancient repute in the treatment of distempered eyes,[1] a fact fully explained in the light of modern scientific knowledge. Corrosive sublimate is a most valuable and active antiseptic, but has the drawbacks of being poisonous and of coagulating albumen. It also is apt to cause some pain when applied to the eye. Mercurial poisoning, or "mercurialism," as it is called, is recognised by soreness of the gums and loosening of the teeth, by fœtor of the breath, by "salivation"—a profuse flow of saliva from the mouth,—by griping, by diarrhœa, and occasionally by tremors and other nervous symptoms. But it is scarcely likely to follow the local use of the remedy.

The red oxide of mercury was formerly much used, but is now largely replaced by the yellow oxide, which is employed as an ointment containing four to sixteen grains to the ounce of vaseline. This preparation is widely known as "Pagenstecher's" or "Yellow" Ointment.

Ammoniated Mercury and Nitrate of Mercury are also used in the form of ointments.

Calomel is a good antiseptic dusting powder, and is often used in superficial inflammations of the eye.

[1] A famous antiseptic wash for the eyes, known as "Mackenzie's Eye Wash," is still extensively used. It contains, among other things, corrosive sublimate.

Its action probably depends on its slow conversion into corrosive sublimate by the salt tears; at any rate, it is insoluble in water.

Blue ointment is sometimes used for inunction, a process which will be described later on.

Chinosol.—This yellow crystalline powder (readily soluble in water) is used as an antiseptic wash for the conjunctiva—strength 1 : 2000.

Argyrol.—This organic compound of silver, sometimes known as "Silver Vitelline," is extensively used in the treatment of superficial inflammations of the eye, as conjunctivitis and ulcers of the cornea, as well as in affections of the tear passages. It is very soluble in water, forming a dark-brown solution. It is used in various strengths, from 5 per cent. to 25 per cent.

Sophol.—This remedy acts much in the same way as argyrol.

Protargol.—This organic compound of silver is employed, especially in ophthalmia neonatorum, as a 10 per cent. to 50 per cent. solution, which is dropped into the eye or painted over the everted eyelids once or twice daily.

Largin another organic compound of silver. It is applied as a 10 per cent. solution to the conjunctiva in acute muco-purulent ophthalmia and in acute or sub-acute trachoma.

Formalin.—A watery solution, of penetrating odour, containing about 35 per cent. of the vapour, formic aldehyde. It is a wonderful preservative. A 1 : 2000 to 1 : 5000 solution has been used as an antiseptic lotion for the conjunctiva.

Astringents.

These substances cause contraction of blood-vessels, which are thus partially emptied of blood. Most antiseptics are also more or less astringent.

Sulphate of Zinc is used as a lotion, one half to two grains to the ounce of water. Acetate of Zinc, also, is a good astringent. Chloride of Zinc, one to two grains to the ounce of water, has powerful astringent properties, indicated in those common cases of sub-acute or chronic inflammation of the conjunctiva which are due to the Morax-Axenfeld diplobacillus. Sulphocarbolate and permanganate of zinc make excellent astringent lotions.

Sulphate of Copper, lotion of one to four grains to the ounce of water.

Subacetate of Lead as lotion (three grains to the ounce), or as a one to two per cent. ointment. This remedy has fallen into comparative disuse, as there is a great danger of its being deposited and so causing an opacity in the cornea whenever the surface of the latter is in the least broken.

Alum is sometimes used as a lotion (grains one to five to the ounce), but has almost fallen into disuse.

Nitrate of Silver, one half to two grains to the ounce of distilled water, is an invaluable astringent and antiseptic collyrium. Stronger solutions (grains ten, fifteen, or twenty to the ounce) are applied to the conjunctiva in cases of trachoma or of purulent ophthalmia. The solutions should be kept away from the light, or else placed in an amber glass bottle, as otherwise they soon become useless owing to certain chemical changes.

Chlorine water possesses astringent and antiseptic

properties, and is extensively used at the present time. The remedy is, however, an old one.

An extract from the suprarenal gland of animals is used in the form of a solution of Adrenaline Chloride, one of its active principles. Other preparations of it are suprarenin and epirenin. A more recent preparation is built up in the chemist's laboratory and is known as "synthetic suprarenin". This has the great advantage, namely, that it can be boiled without impairing its action. It contracts the blood-vessels of the eye powerfully. It is employed, along with cocaine or holocaine, before operations, in order to prevent bleeding; it is often combined with atropine to increase the power of the latter; and it is also used in the treatment of some diseases of the eye, as glaucoma, iritis, and phlyctenular affections of the conjunctiva and cornea. Its usual strength is 1 : 1000 or 1 : 2000.

Anodynes

are remedies that ease pain, and may be given by the mouth, or applied externally. Those only that are used for their local action will be mentionedhere.

Carbolic acid is to a certain extent anodyne, and so too is atropine. Formerly opium was largely used as a local sedative, chiefly in the form of tincture (laudanum), but its power to relieve pain in this way is somewhat doubtful. Practically, there are only three local anodynes used in eye work, namely, cocaine and holocaine and dionine, the first of which is a white powder obtained from the leaves of the coca plant. Cocaine, which was introduced into

eye work by Dr. C. Koller in the year 1884, has the remarkable property of allaying pain and of destroying ordinary sensation in any part to which it is applied. Its various applications in ophthalmic work will be described in later sections of this book (see also chapter on Anæsthetics).

Dionine, a derivative of morphine, is a very curious agent, now much employed in ophthalmology. When a 5 per cent. to 10 per cent. solution is dropped into the eye, the eye may become red and uncomfortable and the lids may swell up. But, as a rule, pain in the eye is relieved as soon as these symptoms make their appearance, so that dionine is often used as an anodyne. Further uses of dionine are to clear opacities of the cornea, and to assist in the removal of exudations from the interior of the eye.

Irritants.

These are substances that cause a moderate degree of inflammation.

Tincture of opium is an ancient but good irritant to the conjunctiva, this action being most likely due to its contained spirit.

Other irritants are nitrate of silver, sulphate of copper, perchloride of mercury, yellow oxide of mercury, calomel, and the various preparations of zinc.

Counter-Irritants.

Counter-irritants are substances used to excite inflammation at some distance from an affected part.

The commonest plan in eye surgery is to put a fly-blister, the size of a shilling or a half-crown, on

the temple or behind the ear. The blistering plaster, cut to the required shape, is slightly warmed and kept in place by strips of sticking-plaster, where it is left for four or five hours, or until a blister has risen. Instead of the plaster, the nurse may use blistering fluid, which she will have to paint carefully over the spot with a brush three or four times in succession. Suppose a blister to be ordered of the size of a shilling, the exact size can be marked out by lightly pressing one of those coins for a few seconds on the selected spot. The blister itself is a kind of thin bladder, formed beneath the outermost layer of skin, and filled with fluid. It should be pricked with a needle in several places to let out the fluid, after which it can be dressed with boric or other soothing ointment. Sometimes it is desirable to keep up the irritation, in which case the raw surface is kept from healing by the application of Scott's dressing or of the resin or savine ointments.

A less severe form of counter-irritation can be obtained by painting over a spot on the temple with the strong liniment of iodine. If this be used, the patient must lie down while the application is being made, and the utmost care must be taken that none of the liniment gets into or near the eyes, a caution that applies equally to blistering fluid.

A seton affords the most powerful form of continuous counter-irritation. It is applied by the surgeon, who passes a large needle, armed with lamp wick, for a distance of an inch or more beneath

the skin of the hairy scalp. The two ends of the seton are then tied loosely together, and a dressing of simple ointment or vaseline applied. The seton will require daily dressing, when its track should be syringed with one in forty carbolic lotion, and subsequently dressed with ointment. Every third day the ends of the thread must be cut, and a fresh wick pulled into the wound. The seton is seldom used nowadays.

In what is sometimes called the "Edinburgh method of Counter-irritation," a stick of solid silver nitrate is drawn over the surface of the slightly moistened skin of the upper eyelid.

Counter-irritants are not much used in eye-surgery nowadays. They have to a large extent been replaced by more rational and less irritating methods of treatment.

Caustics.

Caustics are substances that destroy tissues when applied to them locally. In eye work they are used, as a rule, in solid form.

Nitrate of silver is diluted (or "mitigated") with nitrate of potash, and sold as caustic points, which are still sometimes used in the treatment of trachoma although a 2 per cent. solution of silver nitrate is another favourite in trachoma, where it is painted over the palpebral conjunctiva, first exposed by everting the eyelids. Weaker solutions are sometimes ordered by the surgeon for home use. Perchloride of mercury, diluted in the same way, is also applied in that affection; and alum and sulphate of copper and sulphate of zinc are sometimes rubbed on in solid form.

Lapis divinus, sold in sticks, is mitigated sulphate of copper. To prepare it for the surgeon, the nurse will have to melt it gently in a spirit flame, and then wipe off the excess of melted stick until it is of a proper pointed shape.

Rarely, a paste consisting of zinc chloride is applied to the orbit after removal of its contents, as in cases of cancer. The application is not made until bleeding and oozing following the operation have ceased. The caustic paste is then spread upon strips of lint which are placed in the orbit, the whole being kept in place by a pad and bandage. To avoid excoriation of the face by any overflow of the ointment, the cheek should previously be smeared with castor or olive oil. Severe pain, calling for the administration of opiates, is liable to follow the use of the caustic, a contingency for which the nurse must be prepared.

Actual Cautery.

The application of heat to destroy tissue and, incidentally, micro-organisms. The cautery may be applied by heating an instrument in a spirit flame (thermo-cautery), or more conveniently by an apparatus known as "Paquelin's cautery". The galvano-cautery, also, is extensively used in eye-surgery.

Myotics.

Myotics are drugs that contract the pupil: pupil contractors.

Physostigmine (the older and still frequently employed name for which was eserine) is the active principle of calabar bean, and has a most powerful

myotic action. When a few drops of a solution of the strength of one-half to a grain to the ounce of water of the sulphate or salicylate of physostigmine are dropped into the eye, they cause the pupil to contract rapidly to the size of a pin point. Eserine is used in glaucoma and in some corneal ulcers.

Pilocarpine contracts the pupil but less energetically, and is used as a 1 or 2 per cent. solution as a substitute for eserine in some forms of glaucoma.

Mydriatics.

Mydriatics expand or dilate the pupil.

Belladonna is a powerful mydriatic. Formerly it was much used as a solution of the green extract, and some surgeons still resort to belladonna fomentations. Nowadays, however, the active principle—atropine—is extracted from the plant. With atropine, or its salts, a rapid and certain effect can be obtained with a very minute quantity of the drug. It is applied as a solution (grains one to four to the ounce), in an ointment, in a gelatine disc, or in solid form; a solution in oil, also, is often prescribed.

The local use of atropine occasionally gives rise to various unpleasant symptoms, the chief of which are —(1) Dryness and parching of the throat, indicated by smacking of the lips. (2) Swelling of the lids, with redness of the surrounding parts, much resembling erysipelas of the face. (3) Restlessness and delirium, especially at night: this I have observed amongst children only. (4) After long-continued use, it may give rise to a catarrhal condition of the conjunctiva,

with the development of small granulations. *Should any of these symptoms appear, the nurse should at once discontinue the use of atropine, and immediately inform the surgeon of the occurrence.*

The effects of atropine upon the pupil pass off slowly; sight is disturbed for a time, and the pupil does not regain its ordinary condition for about a fortnight.

Homatropine, a costly drug, is another alkaloid of belladonna. It has the advantage of causing much less annoyance to patients than atropine, as its effects pass off within twenty-four hours, although, exceptionally, they may last for some days. As a 1 per cent. to 2 per cent. solution, often combined with cocaine, it is largely employed in the out-patient room of an ophthalmic hospital before estimating a patient's refraction. Under these circumstances six applications are generally made at intervals of five minutes. After waiting, with closed eyes, for half an hour or so, the patient is usually fit to be tested by the surgeon.

Duboisine and daturine and scopolamine dilate the pupil, and are sometimes used when atropine does not agree with the patient. They are all very poisonous.

Cocaine acts in a similar way, but a pupil dilated by cocaine still reacts to light, which is not the case when atropine is used.

Euphthalmine dilates the pupil when dropped into the eye, without affecting accommodation to any great extent. It is therefore often used, as a 5 per cent. solution of the hydrochloride, especially when

it is merely wished to dilate the pupil for ophthalmoscopic examination.

Mydrine, in 10 per cent. solution, acts like euphthalmine.

Vaccines and Sera.

By the injection of vaccines and sera we endeavour to neutralise poisons produced in the patient's system by various micro-organisms. Serum finds its chief application in cases of diphtheria of the conjunctiva. Vaccines, often prepared from bacteria obtained from the patient's lesion, have been tried with more or less success in many infective diseases of the eye.

Salvarsan.

Salvarsan or "606" is an organic preparation of arsenic introduced by Professor Ehrlich as a remedy for syphilis. Its effects in some cases are simply wonderful, and it is much used nowadays by ophthalmic surgeons. The remedy, prepared immediately before use, is injected into (*a*) the muscles, or (*b*) the veins. The patient is in bed, where he remains for several hours after the injection has been made. If Salvarsan is to be injected into the veins, which is usually the case now, those at the bend of the elbow are chosen as a rule, and a nurse may be called upon to sterilise the skin prior to the little operation. This is generally done by careful cleansing with soap and hot water in the first place, followed by the application of ether or absolute alcohol to the parts, which are lastly protected from contamination by the application of a sterile pad and bandage. But a nurse

should always obtain precise instruction on these points from the surgeon.

Another product, called "Neosalvarsan" or "914," has recently been introduced by Professor Ehrlich. It acts like Salvarsan, but is much simpler to prepare.

Various Remedies.

Fluoresceïn, a coal-tar derivative, stains the cornea a vivid green if ulcerated, but has no action whatever on the healthy cornea. It also stains a denuded patch on the conjunctiva. It colours, too, any discharge that may be present in the eyes. To apply fluoresceïn, a drop of 2 per cent. cocaine should first be dropped into the eye. Then the fluoresceïn is used. After waiting a few minutes, the surplus stain is washed away with saline or boric lotion, the patient's face is freed from traces of the stain, and he is presented to the surgeon for examination.

Pilocarpine, besides it local use, is injected beneath the skin to cause sweating and salivation. The idea is that exudations may be thus absorbed, and it is used for detached retina and other deep-seated eye troubles.

An infusion of jequirity seeds has been much lauded as a remedy for trachoma. Applied directly to the conjunctiva, it gives rise to acute inflammation of that structure. It is now often replaced by jequiritol.

Carbon Dioxide Snow.—A compressed gas, called carbon dioxide, which becomes frozen when allowed to escape into the air, is used for certain affections of

the skin of the eyelids, as rodent ulcer, and of the eye, as trachoma.

Radium has numerous applications in ophthalmology. *The X-rays* are also used. *Electricity* is less employed now than it was but a few years ago.

Subconjunctival Injections.

Certain remedies, as solutions of common salt, corrosive sublimate, and mercury oxy-cyanide, are applied to the eye by injection beneath the ocular conjunctiva into Tenon's space or capsule—that is to say, the socket in which the eyeball rotates, formed by the fasciæ of the orbit and external muscles of the eye. Applied in this way they are believed by many surgeons to act better than if merely dropped into the eye. The application is made as follows: the eye is first rendered insensitive by a drop or two of cocaine (2 per cent. to 5 per cent.), and the syringe and the solution are most carefully sterilised. The patient is directed to look downwards and inwards, and the upper lid being raised by the surgeon's finger, the needle is passed beneath the conjunctiva as far from the cornea as possible in the upper and outer part of the eyeball now exposed. The fluid is then slowly injected. A bandage may or may not be applied. These injections are used more particularly in septic ulcers of the cornea and in deep-seated affections of the eyeball, such as choroiditis.

Poultices.

Poultices, as such, are seldom used in ophthalmic

work; they have, to a great extent, been replaced by wet compresses. These "antiseptic poultices," as they have been termed, are composed of several layers of lint steeped in hot boric lotion, and covered with an overlapping piece of jaconet. Absorbent wool packing and a bandage complete the dressing.

Blood-letting.

In former times a copious withdrawal of blood from the arm was looked upon as a sovereign remedy for acute ophthalmia, and, accordingly, patients were often bled until they dropped from sheer exhaustion. Blood was even let before a cataract was removed from the eye.

Nowadays, bleeding is effected by scarifying the conjunctiva, by opening an artery in the temple, or by the application of leeches. The first two methods are, of course, carried out by the surgeon, but the nurse may be called upon to perform the third.

Formerly, leeches were applied to the conjunctiva of the lids, or to the inside of the nostrils; but those sites have been abandoned in favour of the temple, the forehead, the side of the nose, or behind the ear. The nurse should wash the skin of the part selected, and apply the leech by means of a test tube. If the animal will not bite, the part may be smeared with cream or with a little fresh blood. Each leech abstracts about a drachm and a half of blood, and will drop off when full. Bleeding may be encouraged by warm fomentations afterwards. An extract from the body of the leech has the singular property of ar-

resting the clotting of blood. The reader will not be astonished, therefore, to learn that sometimes there may be difficulty in staunching the flow of blood from the bite, but this may be generally effected by firm pressure against the underlying bone. One reason why leeches are not applied to the lids is that it would be difficult to apply after-pressure in that situation.

A method of abstracting blood, peculiar to ophthalmic surgery, is by the use of an instrument named the "artificial leech," which consists of two parts, a sharp drill and a cupping glass. The drill is driven into the skin of the temple, and blood is drawn away by exhausting the cupping glass. Some surgeons dispense with the drill, and make instead numerous punctures in the skin by means of a small sharp scalpel. The artificial leech is used in severe cases of iritis, and for various deep-seated affections; and there is no doubt that at times it renders valuable service in the treatment of those diseases.

Eye Baths.

A mineral spring at Buxton has gained some repute in the treatment of inflamed eyes, and in the pump-room there one may see to this day peculiar-looking goblets of green glass or earthenware. One of these vessels is filled with the mineral water, and the patient leans downwards, and fits the cup closely to his brow and cheek, so as to cover the eye. He then throws his head backwards, still keeping the cup in place, and in this way the eye is immersed in a local bath. Although the "eye baths," as they are called, still linger at Buxton and in the windows

of the chemists, their general use has been long ago abandoned. Under certain conditions, it is easy to see how they would hand on contagion from one person to another.

Inunction.

Inunction in eye diseases is confined to the use of mercurial ointments. It consists in pressing and rubbing a greasy or oily substance into the skin, through which it is absorbed into the circulation. Inunction is generally prolonged over a length of time, and, in order to avoid irritation, the ointment should be applied to a different part of the body every day. The skin is first washed and dried, and a piece of ointment, about the size of a pea, is gently rubbed in until it has disappeared. The nurse should protect her finger with a stall or a piece of bladder, or otherwise she may medicate herself as well as the patient. Formerly, the blue mercurial ointment was the only remedy used for inunction, but modern pharmacy has given us a more cleanly agent in the shape of the oleate. The symptoms of mercurialism have been previously pointed out (page 46). It is part of a nurse's duty to watch for such symptoms, and at once to notify the surgeon when they make their appearance.

CHAPTER V.

APPLICATION OF REMEDIES TO THE EYE.—DRY AND WET COMPRESSES. — LOTIONS. — DROPS. — OINTMENTS. — MASSAGE.—POWDERS.—SOLID AND LIQUID APPLICATIONS TO THE EYELIDS.

Dry Compresses.

A PROTECTIVE compress is usually made of old linen and a thick wad of absorbent wool, which is packed into the hollow over the eyeball, and held in place with a flannel bandage. A simple pad of Gamgee or Robinson tissue may be used instead of the cotton-wool.

Dry heat, which has numerous uses in ophthalmic work, may be thus applied: a dry compress is held in contact with the outside of a can of boiling water for some minutes; it is then rapidly placed over the closed eyelids, and a bandage applied. Another plan is to warm the wool by holding it in front of the fire or by putting it on a plate in the oven. The application is renewed at frequent intervals. Other ways of applying dry heat are by means of an incandescent electric lamp, or a Japanese hand-warmer, wrapped in lint and placed over the closed eyelids. In this way a temperature of about 110° F. can be obtained. Special electric heaters, as that devised by Dr. E. Maddox, are upon the market.

Wet Compresses.

Wet compresses may be used either hot or cold.

Cold applications are of service in acute ophthalmia, in injuries, or after certain operations. They may be applied in either of the following ways.

1. A piece of tape, one inch broad, is bound around the patient's head, and to it is pinned a single square of old linen or lint, kept constantly moistened with water. A lump of ice floats in the basin containing the water, the temperature of which is thus kept at a low point. As soon as the first square ceases to feel cold, it is replaced by a second taken from the iced water. For the plain water an antiseptic lotion of carbolic acid, boric acid, or corrosive sublimate may, of course, be substituted.

2. "By the side of the bed is placed a large block of ice. Two pads of cotton-wool are provided, one of which is laid upon the ice, and the other upon the eye of the patient, and they are changed as often as the one in use ceases to give a sensation of cold" (W. Adams Frost).

A nurse must remember that the intermittent action of cold is harmful to an eye. She must take care, therefore, that the pads are renewed at frequent intervals.

An old way of applying cold to the eyes was to enclose crushed ice in a bladder, which was then laid over the closed lids. The objection to this plan lies in the fact that the ice by its very weight presses injuriously upon the eye; and the same objection applies with added force in the case of Leiter's metallic tubes, formerly much used.

Hot compresses—perhaps the most potent means of combating pain possessed by the surgeon—are used in a variety of diseases, as iritis or ulcer of the cornea.

To apply a hot compress.—Several folds of linen or lint are dipped into really hot water, squeezed as dry as possible, if necessary with two sticks, applied to the lids, and covered with oiled silk. This is then packed in with a thick layer of dry wool, heated by contact with the outside of a can of boiling water, and bandaged into position. A more simple but perhaps equally efficacious plan is to wring a towel out of hot water, and to apply it to the closed eyelids. As soon as the first application begins to grow cold, it must be replaced by a second towel similarly treated.

In another and a good plan the bowl of a wooden cooking or salad spoon, rather deep in the bowl, is wrapped with Gamgee tissue. Hot water or saline or boric lotion is applied to the closed eyelids with the concave side of the spoon, and the temperature of the lotion is gradually raised by the addition of boiling water (Wm. Lang).

Hot compresses are often ordered by the surgeon for half an hour twice or thrice a day, but the exact number of the applications will depend, of course, upon the nature of the case. A nurse should always obtain precise directions on this point.

Compresses should always be as hot as the patient can bear, and undue pressure upon the eye must be most carefully avoided.

One additional point should be mentioned, namely, that both hot and cold compresses are not unlikely

to chafe a tender skin. It is in view of this fact that one protects the skin by smearing over it a layer of vaseline, cold cream, glycerine, or almond oil before applying this kind of dressing, whilst, after removal, the skin is carefully dried.

Application of Lotions to the Eye.

Lotions are employed chiefly for the relief and cure of conjunctival affections. The usual method of applying these medicaments—*viz.*, by squeezing a little lotion into the eye—is obviously inadequate, because the remedy is not brought into contact with the whole of the diseased surface. In order to do this, the eyelids must be turned out, or "everted," as the process is usually called. Accordingly, this section may be prefaced with an account of the small operation necessary to evert the lids.

Eversion of the Lower Lid.—It is a simple matter to turn out the lower lid. Standing behind her patient, the nurse places her forefinger or thumb on the skin below the eye, and merely draws it downwards. If at the same moment the patient looks upwards, the conjunctival lining of the lower lid springs into view.

Eversion of the Upper Lid.—Skilful eversion of the upper lid, one of the first knacks which a nurse has to acquire, is a more difficult matter, and is carried out as follows.—Taking her stand behind the patient, the nurse tells him to look down, a point of considerable importance, for it is almost impossible to evert the lids of a person who will not look in the desired direction. The nurse next seizes the

lashes of the upper lid between her thumb and forefinger, using the right hand for the patient's right eye, and *vice versâ*. The lid is then drawn downwards and outwards, after which the nurse places the forefinger of her disengaged hand on the upper part of the lid, so as to act as a fulcrum. Lastly, by a rapid movement, the lid is twisted round the finger, and so everted. After some little practice, intervention of the second hand can be altogether dispensed with: the lid is then turned out by the forefinger and the thumb of one hand alone. A nurse should also practise eversion of the upper lid while standing in front of her patient. Text-books recommend that a silver probe or similar instrument be laid across the upper lid, and that this structure be everted by tilting it, so to speak, around the probe. But it is better that a nurse should learn so to use her fingers as to be able to forego any such outside aid. The practised hand is able to evert the lid almost literally in "the twinkling of an eye," although nothing requires more careful attention at the outset.

In cases not confined to bed, the following simple method of applying lotions used to be adopted at the Hanwell Ophthalmic School.—The patient is seated in an ordinary windsor or kitchen chair, and a towel is arranged around his neck. The nurse stands behind the patient, who rests his head upon her chest. She next everts the upper lid, using, as I have said before, the right hand for the right eye, and *vice versâ*. If without assistance, she everts the lower lid with the disengaged fingers of the hand in use

upon the upper lid; or the patient himself might pull his lid downwards. A much better plan, however, is for an assistant, standing in front of the patient, to evert the lower lid fully. A pledget of wool, which has meanwhile lain in a porringer containing lotion, is then squeezed, so that its contents fall directly upon the exposed conjunctiva. The liquid is allowed to remain in contact with the mucous membrane for some seconds before the lids are restored to their natural position. The last step is to mop superfluous lotion from the face by means of a morsel of dry wool, which, together with the piece first used, is at once destroyed.

Should the patient be in bed, the nurse may station herself either behind him or at his side, but the way of applying lotion nowise differs from that above described.

Sponges should never be used. They are difficult to cleanse thoroughly, and are apt, moreover, to harbour the germs of disease.

Syringes are still sometimes employed, but personally I, in common with many ophthalmic surgeons, am opposed to their use in eye work. In point of fact, there are many objections to them. In the first place, the forcible stream thrown by a syringe may damage an eye. Secondly, injected fluids are apt to spurt in all directions, and particles of contagious discharge may thus infect the nurse's eyes. There is reason for believing that this casualty has often taken place. Sir Patrick Macgregor has recorded the case of a nurse who received a spurt of matter

lashes of the upper lid between her thumb and forefinger, using the right hand for the patient's right eye, and *vice versâ*. The lid is then drawn downwards and outwards, after which the nurse places the forefinger of her disengaged hand on the upper part of the lid, so as to act as a fulcrum. Lastly, by a rapid movement, the lid is twisted round the finger, and so everted. After some little practice, intervention of the second hand can be altogether dispensed with: the lid is then turned out by the forefinger and the thumb of one hand alone. A nurse should also practise eversion of the upper lid while standing in front of her patient. Text-books recommend that a silver probe or similar instrument be laid across the upper lid, and that this structure be everted by tilting it, so to speak, around the probe. But it is better that a nurse should learn so to use her fingers as to be able to forego any such outside aid. The practised hand is able to evert the lid almost literally in "the twinkling of an eye," although nothing requires more careful attention at the outset.

In cases not confined to bed, the following simple method of applying lotions used to be adopted at the Hanwell Ophthalmic School.—The patient is seated in an ordinary windsor or kitchen chair, and a towel is arranged around his neck. The nurse stands behind the patient, who rests his head upon her chest. She next everts the upper lid, using, as I have said before, the right hand for the right eye, and *vice versâ*. If without assistance, she everts the lower lid with the disengaged fingers of the hand in use

upon the upper lid; or the patient himself might pull his lid downwards. A much better plan, however, is for an assistant, standing in front of the patient, to evert the lower lid fully. A pledget of wool, which has meanwhile lain in a porringer containing lotion, is then squeezed, so that its contents fall directly upon the exposed conjunctiva. The liquid is allowed to remain in contact with the mucous membrane for some seconds before the lids are restored to their natural position. The last step is to mop superfluous lotion from the face by means of a morsel of dry wool, which, together with the piece first used, is at once destroyed.

Should the patient be in bed, the nurse may station herself either behind him or at his side, but the way of applying lotion nowise differs from that above described.

Sponges should never be used. They are difficult to cleanse thoroughly, and are apt, moreover, to harbour the germs of disease.

Syringes are still sometimes employed, but personally I, in common with many ophthalmic surgeons, am opposed to their use in eye work. In point of fact, there are many objections to them. In the first place, the forcible stream thrown by a syringe may damage an eye. Secondly, injected fluids are apt to spurt in all directions, and particles of contagious discharge may thus infect the nurse's eyes. There is reason for believing that this casualty has often taken place. Sir Patrick Macgregor has recorded the case of a nurse who received a spurt of matter

into her left eye while syringing the conjunctiva of a child affected with purulent ophthalmia. On the next day, symptoms of the disease developed in that eye. Similar cases have been placed on record by Vetch, Middlemore, and Tyrrell. I have myself known three instances in which ophthalmia was thus contracted, while I have heard of many others. Thirdly, the careless use of a glass syringe may injure the eyeball itself. In an eye with purulent ophthalmia, a minute abrasion of the cornea may admit septic organisms, and so lead to most disastrous consequences. Mr. Charles Wray has introduced a syringe, the nozzle of which consists of a soft elastic pipe. This simple device certainly renders the syringe safer, but at the same time it does not provide against the danger of inoculating oneself by accidental spurts of matter. Lastly, a syringe is difficult to keep clean.

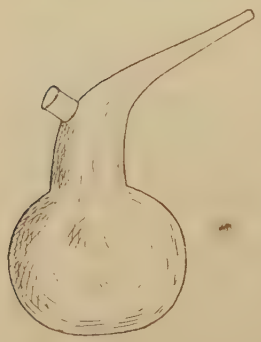

Fig. 9. "Undine."

A much better plan is to employ a so-called "Undine"—that is to say, a thin glass flask fitted with two spouts, as shown in Figure 9. Flask and contents can be sterilised in the steam steriliser.

In cases of purulent ophthalmia, the lids may be so swollen that they can be separated with difficulty, if at all, and the condition of the cornea cannot be ascertained by the ordinary methods. Under such circumstances, the surgeon uses an instru-

Fig. 10. Retractor.

ment called a "retractor" (Figs. 10 and 69), by the aid of which he raises the upper lid, the nurse meanwhile drawing the lower lid downwards, either with her fingers or by means of a second retractor. On an emergency, a bent and sterilised hair-pin may be used instead of a retractor.

The ingenious combination of douche with retractor, represented in Figure 11, is sometimes employed. The instrument is channelled for the passage of fluid, which finds an exit by a series of small holes in the curved part of the retractor which passes beneath the lid. The nozzle of the instrument is connected by means of a flexible tube with some sort of irrigating apparatus. An

Fig. 11. Combined Douche and Retractor.

ordinary ewer, supported some three feet above the patient's head, makes a good receptacle for the fluid. A clip is placed upon the tubing between ewer and retractor. When the clip is loosened, a continuous stream of fluid runs into the eye from the perforated end of the retractor, and the force of the stream is directly dependent on the height to which the ewer is raised above the patient's head.

The formal instrument just described may be replaced by a simple contrivance, introduced by Mr. J. B. Story, which acts as a combined douche and retractor. A piece of wire is covered with drainage tube, and is then bent to the shape of a retractor, one end of the tube is doubled over, and fastened to the wire by thread. A number of small holes are next cut over the summit of the horseshoe bend which passes beneath the lid, and, lastly, the free end of the tubing is connected with an irrigator. This instrument, which is shown in Figure 12, has the advantage that it can be easily altered in size and shape to suit each particular case. When required for use, it is inserted beneath the upper lid, which is thus elevated, and the whole conjunctival sac can be then thoroughly sluiced by the fluid from the irrigator.

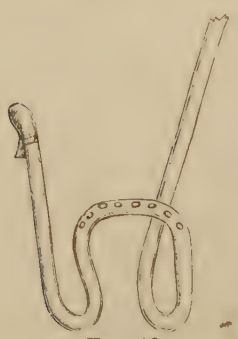

FIG. 12.
MAKESHIFT DOUCHE RETRACTOR.

Application of Drops to the Eye.

Drops (*guttæ*, in Latin) are used in smaller quantities than lotions. They are employed for various purposes, as, for example, to dilate the pupil in iritis, to contract the pupil in glaucoma, to relieve pain in affections of the cornea, or to act upon an inflamed conjunctiva.

Fig. 13. Glass Dropping Tube fitted with an India-rubber Teat.

If ordered for the relief of conjunctival affections, drops are applied after eversion of the lids, exactly as described in the case of lotions. Sulphate of copper and nitrate of silver and argyrol drops are applied in this manner.

On the other hand, if it be desired to act, not upon the conjunctiva, but upon deeper structures, the medicament is used in a different way. Thus, the lower lid is drawn gently down, and the patient desired to look upward. One drop or more of the fluid is then allowed to fall upon the exposed conjunctiva from any of the following tubes or bottles. In doing this, the nurse must never forget that the dropper, whatever its form, should on no account be allowed to touch the lids or the eyeball. She must also be careful to hold the dropper vertically and not slantwise, as is so often done.

On an emergency, a spill of clean white notepaper or a shaped goose quill or a glass rod may be used as a dropper.

1. The dropping tube made of glass, of similar shape, and acting on the same principle as the cut quill. It is often fitted at the upper end with an india-rubber teat, as shown in the illustration (Fig. 13). The fluid is drawn into and expelled from the tube by squeezing the teat.

2. The "Pneumatic Dropping Tube" is a small glass flask, the neck of which is drawn out into a fine point. It is filled by holding the flask in the palm of the hand for a few seconds, when the air becomes expanded. The nozzle of the bottle is then inserted into the liquid, which is drawn into the bulb as soon as the air gets cool. It is now ready for use, and by inverting the flask, grasped in the hand, the solution will fall from the point drop by drop. Messrs. Reynolds & Branson (of Leeds) have made a useful modification of the above by replacing the glass neck with a cork and a piece of thermometer tubing, the capillary bore of which delivers the liquid in small drops. The flask is shown of its actual size in Fig. 14.

Fig. 14. Pneumatic Drop Bottle.

3. Chalk's eye-drop bottle is the one in everyday

use. Its perforated glass stopper, which reaches to the bottom of the bottle, is capped by a sheet of thin india-rubber. The flasks are made in half ounce, one, and two ounce sizes. The illustration (Fig. 15) shows the bottle. To replace worn rubber tops, tie on a sheet of india-rubber, or use a rubber cap, such as is employed by bacteriologists to cover tubes of nutrient media.

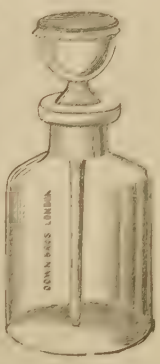

Fig. 15. Chalk's Eye drop Bottle.

4. Stroschein's aseptic bottle (Fig. 16). This is by far the best form of bottle, from the fact that it can be sterilised by boiling the contained fluid. Figure 16, I. represents the bottle as ready for use. The flask is constructed of thin glass, so as to bear heat without breaking. In order to sterilise the contained solution, the nipple (T) is removed, the pipette reversed, and inserted into the flask, as shown in Figure 16, II. The whole apparatus is then boiled over a small flame—*e.g.*, that of a spirit lamp—for three minutes. During this process the flask may be either held by a wooden clip, or it may be supported by wire gauze on a tripod. Thirty seconds after removal of the bottle from the flame, the pipette is inserted in its original position, the teat is replaced, and the bottle (as in the first figure) is ready for use. If the flask is in constant use, the boiling process must be repeated at intervals of a few days. It is evident, however, that repeated sterilisations must of

necessity concentrate the solutions, a difficulty that is met by adding eight or ten drops of sterilised water to the contents of the flask before boiling. The bottles are of different colours, so that the various medicaments can be recognised at a glance; and, further, the name of the contained solution is indel-

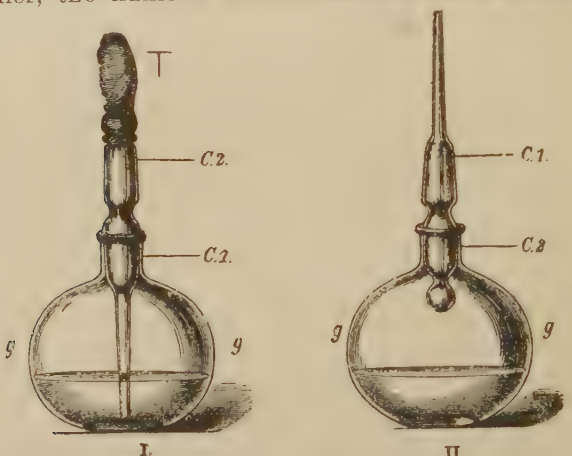

FIG. 16. STROSCHEIN'S ASEPTIC FLASKS. READY FOR USE. SHOWS POSITION OF PIPETTE BEFORE CONTENTS ARE BOILED.

ibly inscribed upon the face of each flask. Boiling not only renders the apparatus aseptic in every part, but the fluids, also, which in many cases are peculiarly apt to develop a fungus and so become spoiled, are thoroughly purified from the presence of micro-organisms.

5. The Llewellyn flask, shown in Figure 17, is in fact a small "Undine," and, like the Stroschein bottle, the contained fluid can be boiled.

6. Sidler-Huguenin's bottle, depicted in Figure 18, is also one the contents of which can be sterilised by boiling. It has, besides, one or two additional advantages: 1st, owing to the peculiar construction of the pipette, fluid cannot enter into the rubber-capped bulb when it is held upside down; 2nd, its capacious mouth renders it unlikely that the pipette, when replaced, will touch the side of the bottle and thus become contaminated.

FIG. 17.
LLEWELLYN'S FLASK.

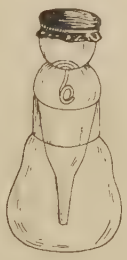

FIG. 18.
SIDLER-HUGUENIN'S BOTTLE.

The following simple method of applying drops often succeeds with "spoilt" children.—Lay the patient flat upon his back, and drop the fluid over the eyelids in such a way that it collects and forms a small pool at the inner canthus. Now prevail upon the patient to open his eyes, when some of the liquid is practically certain to enter the conjunctival sac; or the nurse may gently separate the lids, and so attain the same result.

Before leaving this subject, one caution should be

given.—The alkaloids used in the form of drops are capable of exerting their peculiar action even when much diluted. It is, for instance, by no means rare for a nurse, who has neglected to wash her hands after applying atropine, to get a dilated pupil herself from touching her eyes. The moral is obvious, and need not be laboured.

Application of Ointment to the Eye.

Many remedies are used in the form of ointment (*unguentum*) made with vaseline. Such an application may be prescribed for disease of the lids, as blepharitis, or for an affection of the eyeball itself. In the former case, the ointment is well rubbed into the affected lashes, all scabs having been first removed by repeated applications of hot water. In the latter case, the remedy is applied as follows.—A small camel-hair pencil (that known to the trade as a "short crow" is the best) is dipped into the ointment, and the brush is inserted between the lower lid and the globe. The lids are then allowed to close, and the brush is gently drawn away at the outer corner of the eye, thus leaving some ointment in contact with the latter. The brush must not, of course, be used for more than one person, and it should be disinfected every time after an application has been made.

A much more cleanly plan is to use, instead of a brush, a piece of glass rod, having a smooth and narrow end (Fig. 19).

On an emergency, a bodkin or a silver probe or a paper spill may be used in lieu of rod or brush.

A kind of *Massage* has been practised upon the eye from very early times. After introduction of the ointment, the nurse places her forefinger on the closed lids, and makes rapid circular movements, so as to bring the unguent into intimate contact with every part of the cornea and conjunctiva. Next, up and down, and, lastly, side to side movements are exe-

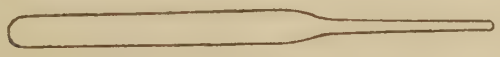

Fig. 19. Glass Rod for the Application of Ointment.

cuted. The pressure must be firm yet gentle; and care must be taken that the greasy finger does not enter the aperture of the lids, and so injure the eye. The rubbing must be continued until the eye becomes slightly red and tender—usually from two to four minutes. The last step is to wipe away superfluous ointment by means of cotton-wool. Some little prac-

Fig. 20. Syringe for Introducing Ointment into the Conjunctival Sac.

tice is needed before massage of the eye can be efficiently carried out.

In concluding this section it may be added that iodoform or lenicet ointment or pure vaseline has been strongly recommended in the treatment of purulent ophthalmia. Should the nurse be called upon to make such an application, she will probably find it best to use the syringe shown in Figure 20. The nozzle

is introduced with the utmost care beneath the lid, and the ointment gently expelled.

Application of Powders to the Eye.

Powders (calomel, boric acid, iodoform, iodol, aristol, alumnol) are sometimes applied directly to the conjunctiva or to the cornea. They are thus used, for example, in ulcers of the cornea, and in all kinds of phlyctenular disease.

Insufflators may be, of course, used for the purpose of making these applications, but a simpler plan is generally preferred. Thus, a small portion of the powder is taken up by means of a camel-hair pencil, and gently flicked on to the cornea or the conjunctiva, as the case may be.

With regard to calomel, a special caution should be given. Much of that salt must on no account be left in the eye, because its corrosive action may come into play, and so cause serious mischief.

Solid and Liquid Applications to the Eyelids.

For the cure of trachoma, as well as of purulent and sometimes of muco-purulent ophthalmia, strong remedies are applied directly to the conjunctiva of the everted eyelids. Under medical directions, a nurse may be called upon to make these applications, and she should, therefore, fully understand how to do it.

Solids and liquids are both used. The solids in-

clude mitigated silver nitrate,[1] alum, bluestone, and lapis divinus. All these agents are sold either as small conical points, intended to be held in a caustic holder, such as that shown in Figure 21, or cemented into a stout wooden handle and provided with a movable cap (Figure 22). The liquids are nitrate of silver (10, 15, or 20 grs. to distilled water one ounce), corrosive sublimate (1 to 20 and upwards), argyrol, protargol, largin, and liquor plumbi subacetatis.

To apply these remedies, the nurse, standing behind the patient, who is seated in an ordinary chair, everts the upper lid, while an assistant draws the lower lid downwards, and the patient is directed to close his eyes gently. Solid applications are then lightly passed over the exposed conjunctiva, in such a way that every visible part of that membrane receives its due share of treatment. At the same time, no attempt must be made to dip the caustic point behind the conjunctiva, as otherwise the cornea might be touched. To reach the upper cul-de-sac requires both dexterity and practice, and should never be attempted except by the surgeon. In treating the conjunctiva with solid remedies it is safer for the nurse to use the side of the caustic rather than its point.

Liquids are applied by means of a camel-hair brush, the "duck" or the "goose" size being most suitable for the purpose, or a glass rod wrapped with absorbent

[1] Mitigated caustic is prepared by fusing together nitrate of silver and nitrate of potassium in various proportions. The strength usually selected by oculists contains one part of the former to two of the latter salt, and is officially known as *Argenti et Potassii Nitras*. It is, however, not much employed nowadays.

wool at one end may be used. A serviceable mop can be made with absorbent wool and a wooden toothpick. The preliminaries are identical with those described in the case of solid applications. The brush, previously dipped in the fluid, is passed over the diseased parts of the conjunctiva, and the remedy allowed to remain in contact with that membrane for some seconds.

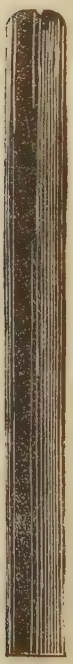

Fig. 21. Caustic Holder.

Brushes, when not in use, may be kept in a flat receptacle—*e.g.*, a tooth-brush dish—covered with an antiseptic lotion. If left standing upright, the brush soon becomes bent out of its ordinary shape, and useless. At the risk of some repetition let me add that brushes should be scrupulously cleansed both before and after use, and that the same brush must never be employed for more than one patient.

Fig. 22. Combined Caustic and Holder.
A Caustic cemented into holder.
B Removable cap.

After application of silver nitrate, many surgeons

neutralise any surplus by means of a large camel-hair brush charged with a solution of common salt. This liquid combines with the silver to form the curdy inactive chloride of silver. For my own part, I never pursue this plan, because the salt tears are sufficient in themselves to neutralise any excess of the caustic. Sometimes, however, when using solutions of silver, I soak up excess of liquid by means of a pledget of wool wrung out of sterile water. If employed to modify the action of solid applications, the wool is used wet; if, on the other hand, to absorb surplus liquid, the wool is squeezed as dry as possible.

A patient sometimes closes his lids so tightly as to interfere with the proper application of remedies. In these circumstances, he should be made to open his mouth widely, and to gape during the whole time. Curiously enough, it becomes a difficult matter to close the eyelids forcibly when the mouth is kept widely open.

It is an excellent plan, before applying these strong remedies to the conjunctiva, to soak up any discharge or moisture which may happen to be present by absorbent wool or gauze. In purulent ophthalmia this step should always be taken. Remedies can scarcely be expected to exert their full action as long as the conjunctiva is shielded by a layer of discharge.

By the application of a drop or so of a two per cent. cocaine solution, the pain of these various remedies may be greatly assuaged. A like result may also be attained by bathing the lids with cold water for ten minutes after treatment.

CHAPTER VI.

ANÆSTHETICS; LOCAL AND GENERAL.

ANÆSTHETICS are agents by means of which insensibility is produced. They may be divided into two classes—general and local. Of the former, we may take chloroform as the type. When chloroform is inhaled, the patient loses consciousness, and the most painful surgical operations are unfelt. On the other hand, local anæsthetics lead to loss of feeling in those parts only to which they are applied. A good example of local anæsthesia is the freezing of the skin by ether spray before proceeding to open an abscess.

The general anæsthetics in common use are chloroform, ether, ethyl chloride, and nitrous oxide, or "laughing gas," as it is sometimes called. Other agents have been tried, but abandoned as possessing no particular advantages. For instance, methylene was formerly in considerable vogue for eye operations, but one seldom hears of it now. A compound of alcohol, chloroform, and ether—the so-called A.C.E. mixture—was also largely employed, but, like methylene, it is somewhat out of favour nowadays, at least so far as ophthalmic surgery is concerned.

Four general anæsthetics, then, are used for eye operations, namely, a gas, nitrous oxide, and three

liquids, chloroform, ether, and ethyl chloride. "Laughing gas" can be employed only for short operations, such as opening abscesses or probing the nasal duct, as its effects pass off usually within a minute or so. On the other hand, the action of chloroform and ether can be prolonged indefinitely, and hence those agents are commonly used.

A nurse will often be called upon to prepare a patient for the administration of chloroform or ether, and to that end the following points must be borne in mind:—

1. The night before an operation, the patient should be given a purgative. Castor oil, "black draught," or indeed any of the remedies in common use may be employed for this purpose. If the purgative selected fails to act, an enema of soap and water or of glycerine may be administered on the morning of operation.

2. An anæsthetic is best given on a fasting stomach. At least four hours must elapse, therefore, between the last meal and the administration of chloroform or of ether. This rule is important under all circumstances, but doubly so in operations upon the eye, where so much depends upon the quietude of the patient. Indeed, it is not going too far to say that some of the deaths during anæsthesia have been directly due to neglect of this precaution, the patient having been choked by lodgment of vomited matters in the windpipe.

3. Weakly patients may be allowed to take two or three wine-glassfuls of beef-tea half an hour or so before operation. But, with this exception, and then only under the orders of the surgeon, nothing

should be given to patients immediately before operation. The same rule applies, of course, to alcoholic stimulants.

4. The patient must be sufficiently and warmly clad when placed upon the operating table. For women, a dressing-gown, in addition to the usual night-gown; for men, trousers and night-shirt are sufficient; for little children, nothing is better than a long flannel night-gown, or a wrapping of Gamgee tissue is both warm and comfortable, although a little expensive. Tight clothing must be eschewed; for instance, corsets would not be worn. The reasons for this precaution are threefold: first, that the chest may be readily examined by the surgeon before operation; secondly, in order that there may be no obstruction to easy breathing; and, thirdly, that artificial respiration may be at once put into play should the necessity arise.

5. Special inquiry should be made as regards artificial teeth, which must be removed before an anæsthetic is given. Perhaps it is just as well, in the case of women at least, for the nurse, by direct examination of the mouth, to assure herself that artificial teeth are not present.

6. Before he is taken to the operating room, the patient should be directed to empty the bladder, as, otherwise, involuntary micturition is likely enough to take place when he is actually on the table.

7. Chloroform (and to a less extent ether) has an irritant action on parts directly exposed to its influence. Accordingly, cold cream or vaseline should

be smeared around the patient's mouth, to avoid excoriation of the skin, before the anæsthetic is given.

Whenever chloroform or ether or ethyl chloride is to be given, the following articles should be provided: stethoscope; tongue forceps; a bowl, in case the patient vomits; clean towels; brandy; hypodermic syringe, containing thirty drops of ether; strong ammonia; an enema syringe; nitrite of amyl; strychnine; and a galvanic battery, in working order, and ready for instant use. These various articles should be arranged upon a small table, destined exclusively for the use of the anæsthetist.

A word as to the management of the patient after the anæsthetic has been given.—He should be put to bed in a quiet room, slightly darkened, and must be carefully watched for some time, because in his semi-consciousness he may tear off the bandages or otherwise injure himself. Children, as a rule, pass into a deep, natural sleep. No solid food ought to be given for some hours after operation. The obstinate retching and vomiting, so often seen, are best treated by small morsels of ice, which the patient sucks, or by a mustard leaf applied to the pit of the stomach. If the operation has not involved opening the anterior chamber, vomiting is often relieved by the somewhat homœopathic plan of letting the patient take repeated sips of hot water.

We may now pass forward to

Local Anæsthetics,

of which three only, cocaine, holocaine, and novocaine, are commonly employed in ophthalmic surgery.

Cocaine is now used in many operations for which a general anæsthetic would have been necessary not so many years ago. Indeed, out of every hundred cataracts ninety-nine are nowadays removed under its influence. This drug, as mentioned in a previous chapter, has the property, when dropped into the eye, of making the superficial parts insensitive to pain, although when thus applied it does not penetrate deeply into the tissues. General anæsthesia by chloroform or ether is still needed, therefore, for operations, such as removal of the eye, which involve the deep structures, unless the cocaine be injected deeply into the tissues of the orbit.

The usual way of applying cocaine is as follows. After the conjunctiva has been purified by mild antiseptics, as already described, a two to five per cent. watery solution of hydrochloride of cocaine or a one per cent. solution of hydrochloride of holocaine or a ten per cent. solution of novocaine is dropped into the eyes three or four times at intervals of a few minutes.[1] Even although the operation is to be limited to one eye, yet a drop or two of the medicament should be put into the other eye. Cocaine has the peculiar property of rendering the act of winking less frequent, probably because the natural stimulus of outside irritation is unfelt. Between the applications, therefore, a patient should keep his lids closed; otherwise, continued exposure may affect the delicate pellicle of the cornea injuriously, rendering it cloudy. A

[1] It is not necessary to apply these agents to the eye at frequent intervals for thirty or forty minutes before operation. Indeed, so prolonged an application is likely to be prejudicial.

nurse will often notice after these applications that the patient's pupil becomes dilated. The cocaine must, of course, be free from impurities, obvious and otherwise; indeed, to attain that end many surgeons recommend that the solution be freshly made with boiling water and filtered immediately before an operation. The better plan, however, is to sterilise the liquid by boiling in one of Stroschein's flasks, which have been described in a previous chapter. Cocaine solutions should be thus purified in every case before an operation which involves opening the eyeball.

The insensibility produced by cocaine lasts for some ten to fifteen minutes, although the maximum effects are reached in about eight minutes. From this it follows that in an operation lasting for more than ten minutes the nurse must be prepared to use cocaine while the surgeon is at work. Eyes reddened from whatever reason, or those whose tension is raised, do not absorb the drug so readily as healthy eyes. Hence such eyes require a somewhat more liberal application of cocaine in the first instance than would otherwise be the case, and some surgeons employ under the circumstances adrenaline in addition to the cocaine.

Cocaine is sometimes employed in the form of small discs of gelatine, each of which contains a definite amount of the salt. These discs, or "*lamellæ*" as they are called, are thus applied.—Fifteen minutes before operation, the patient is directed to open his eyes, and to look upwards. By means of a small camel-hair brush just damped with boric lotion, the nurse then picks up one of the delicate lamellæ,

which she deposits upon the exposed white of the eye, the patient keeping his lids closed until a second application is made five minutes later. At least three wafers should be inserted in all. The fact should perhaps be mentioned that cocaine discs are not regarded with favour by everybody; for there is some evidence to show that operation wounds have been infected by their agency. Indeed, beyond their convenience they have, in my opinion, little to recommend them.

For some operations, instead of solution or discs, solid cocaine is sometimes employed. In this case, the cocaine is dusted over those parts which one wishes to render insensitive. The salt, for example, is thus applied before cutting or crushing operations are performed upon the palpebral conjunctiva, and it may be used in a similar way during the progress of tenotomy for squint, just before the tendon is divided.

In operations involving the skin of the eyelids, it is usual to inject cocaine subcutaneously by means of a syringe, so that it may act upon deep tissues; but this duty is one that concerns the surgeon rather than the nurse.

In order to deaden the pain of operations upon the eye, then, cocaine is used in substance, in solution, in discs, or hypodermically. Nirocaine is also employed hypodermically. Holocaine, owing to its poisonous properties, is never employed hypodermically. Applied to the eye in the ordinary way, however, it has some advantages as compared with cocaine.

CHAPTER VII.

THE COMMONER OPERATIONS UPON THE EYE.

An almost bewildering variety of operations is performed upon the eye, and no small part of the nurse's work will be devoted to duties before, during, and after these procedures. It will be advisable, therefore, to describe briefly the more common operations, so that she may have some idea at all events of what is going on.

Many of these operations deal with the lids. More or less complicated surgical methods are employed to cure a turning in (*entropion*) or a turning out (*ectropion*) of those structures. *Trichiasis*—inturning eyelashes—or *ptosis*—a drooping of the upper lid—may call for interference. The commonest of all operations practised on the lids, however, is the removal of a tarsal tumour or *chalazion*, a growth due, in the first instance at any rate, to blocking of the Meibomian ducts, and consequent retention of secretion. The surgeon everts the lids, cuts through the conjunctiva into the tumour, and shells out its contents by means of a small instrument called a "scoop" (Fig. 49). This trifling operation is usually done in the out-patient room.

In the operation for squint or strabismus, which is of everyday occurrence, the tendon of one of the straight muscles of the eye (generally the internal

rectus) is divided. This operation is known as *tenotomy for squint*. A more complicated procedure, called *muscular advancement*, is often resorted to at the present time. One of the straight muscles is cut away from its attachment to the sclerotic, and, after a piece has been removed from it, the shortened muscle is stitched to a new place on the globe. By these means, the muscle is given more power in moving the eye.

The tear passages are not uncommonly blocked in some part of their course, the most frequent situation for stricture being the nasal duct. In such cases, the fine hair-like passage of the lower canaliculus is slit up by a delicate probe-pointed knife (Fig. 52). Silver probes (Fig. 53) of varying size are then pushed into the lacrymal sac, and down the nasal duct into the nose. The stricture is thus gradually stretched, and the passage again opened. In obstinate cases, some surgeons incise the stricture with a triangular-bladed knife (Fig. 54) before passing probes. Should these various measures fail to give relief, it may be necessary *to extirpate the lacrymal sac*, a radical operation often resorted to nowadays.

The commonest operations upon the conjunctiva are those concerned in the cure of granular lids or trachoma. The granulations are scraped, burnt, or cut away. An operation called "*expression*" is often practised. The folds of diseased conjunctiva are squeezed between the blades of special forceps (Fig. 68), and the offending material is thus pressed out. A more severe proceeding has been

lately carried out, especially in France. After scarifying and scraping the conjunctiva, its surface is vigorously scrubbed with a brush steeped in solution of corrosive sublimate. These operations for trachoma find their justification in the fact that the disease is probably due to a micro-organism lodged in the conjunctiva.

Of late years, the practice of cauterising ulcers of the cornea, which have resisted milder remedies, has become well-nigh general. This operation is done, under cocaine, by means of a Paquelin's thermo-cautery, or, better, by the galvano-cautery. In the absence of those instruments, the surgeon might use, of course, a knitting needle made red-hot in the flame of a spirit lamp. It is interesting to note that the beneficial action of the cautery is believed to be due to direct destruction of the infective micro-organisms.

The anterior chamber is sometimes opened by the surgeon's knife, so as to suffer the aqueous humour to escape. This operation, called *paracentesis*, is performed when the cornea is so seriously ulcerated that the anterior chamber is likely to burst. Another procedure, *corneal section*, is also adopted in cases of severe ulceration. In it the cornea is divided, together with the ulcer, by means of a narrow knife.

Nurses attached to ophthalmic hospitals will often see the operation of *iridectomy*, which is performed for the relief of a number of widely different conditions, such as glaucoma, adherent iris,

etc. Iridectomy consists in opening the anterior chamber by means of an incision in the cornea, and then removing a piece of the iris, so as to leave a gap in that membrane. The incision is made by keratome (Figs. 63 and 64) or by Graefe's cataract knife (Fig. 45). The operation is usually performed under cocaine or holocaine.

Anterior sclerotomy is sometimes performed, instead of iridectomy, in complicated cases of glaucoma. The operation essentially consists in opening the anterior chamber in such a way as to leave undivided a bridge of cornea at the upper part. It is thus performed.—A narrow cataract knife is pushed through the conjunctiva and sclera outside the cornea, made to traverse the anterior chamber, and to emerge at a corresponding point on the inner side of the cornea. The knife is then made to cut upwards by gentle sawing movements. The iris is left intact.

Among the newer operations for glaucoma (all of which are still more or less on trial), may be mentioned combined sclerectomy and iridectomy (Lagrange), the removal of a disc of sclera and cornea by the trephine (Elliot), a modified paracentesis of the anterior chamber (Herbert), the making of a communication between the anterior chamber and the posterior lymph spaces (Heine), and, finally, the introduction of a thread into the angle of the anterior chamber (Mayou-Zorab).

Posterior sclerotomy is sometimes performed as a preliminary to iridectomy in glaucoma. The surgeon thrusts a narrow Graefe cataract knife through the

conjunctiva and the underlying sclera, some distance behind the outer edge of the cornea, in the interval between the insertions of the inferior and the external rectus muscles, and in this way allows a small quantity of vitreous humour to escape from the eye.

Cataract, as previously stated, is, roughly speaking, to be regarded as a loss of transparency in the crystalline lens. Since the opacity lies directly in the line of sight, it must of necessity cause great interference with vision. No medicine is known by the internal use of which the opacity can be resolved; accordingly, the oculist removes the dim lens by a surgical operation. When dealing with cataract in old persons, or senile cataract, as it is called, the operator cuts through the cornea, thus opening the anterior chamber of the eye. Next, he sometimes removes a piece of iris, which he has previously withdrawn by the aid of a delicate pair of forceps; he performs, in fact, an iridectomy. The thin enclosing capsule of the lens is then scratched through by means of an instrument called a cystitome (Fig. 60), or torn away by means of special capsule forceps. Lastly, by gentle pressure on the cornea, the opaque lens is made to leave its natural position, and come altogether outside the eye. The operation thus described is spoken of as "*extraction of senile cataract*". The procedure as described above is called the "combined," but if the iridectomy is omitted, it is spoken of as the "simple" operation. The former is perhaps the favourite nowadays.

The operation is almost always done under cocaine or holocaine.

Cataract may be met with, however, in the eyes of young persons, when a different operation is employed. A fine needle (Fig. 42) is thrust through the cornea, and the capsule of the lens opened with its point. The aqueous is thus brought into actual contact with the lens, which is gradually dissolved by that fluid. The operation has received various names, *viz., discission, the needle operation, or solution of the cataract.* But the action of the aqueous upon the lens is slow, and the needle operation may have to be repeated at intervals of a few weeks. Hence some surgeons hasten matters by introducing a hollow nozzle (Fig. 65) into the anterior chamber, and sucking out the broken-up lens matter. This is called the *suction operation.* Sometimes the *linear operation* is preferred to suction. In that operation, the anterior chamber is opened by a small incision, and by pressure upon the outer lip of the little wound, the aqueous will be evacuated, carrying with it fragments of partially dissolved lens-matter.

It may be necessary to remove the eyeball altogether, an operation spoken of as *enucleation of the globe.* The surgeon, after cutting through the conjunctiva around the cornea, divides with scissors the straight muscles of the eye, each having first been caught with the squint-hook. He then cuts through the optic nerve, the oblique muscles, and any tissues that may retain the eyeball in place. The conjunctiva, muscles, and orbital tissues unite to form a

"stump," upon which an artificial eye is later on supported. Of late years a modification of the above operation has come into prominence. It is called, after its inventor, *Mules' operation*. The surgeon scoops out the whole of the contents of the sclerotic, into the hollow of which a glass ball (the "artificial vitreous humour") is stitched, and allowed to remain altogether. Over this an artificial eye is finally placed.

A very formidable operation, *exenteration of the orbit*, is performed, as a last resource, for cancers involving both eye and orbit. The aperture of the eyelids is enlarged by incision, and everything, including, of course, the eyeball, is taken away from the orbit, thus leaving nothing except the bony walls of that cavity.

After removal of senile cataract, a fine membrane may remain behind in the pupil, thereby interfering with sight. In this event, the surgeon usually performs *discission*, by which operation a hole is made in the membrane. Two needles (Fig. 42) are still commonly employed. They are pushed through opposite sides of the cornea into the anterior chamber, and made to pierce the membrane, in which a hole is torn. There are several other operations for "secondary cataract," as the condition is called, but they need not be gone into here.

CHAPTER VIII.

OPERATIONS IN PRIVATE HOUSES.—GENERAL PREPARATION AND POSITION OF PATIENT.—THE OPERATING TABLE.—LIGHT.—AIR-BORNE INFECTION.—INSTRUMENTS.—SPONGES.—LIGATURES.—PREPARATION OF EYE.—ARRANGEMENTS GENERALLY.

It may be necessary to operate upon the eye not in hospital or a nursing-home but in the patient's own house. The operation is usually carried out in the patient's bedroom, although on the whole it is preferable to do it in another near-by room, specially prepared for the purpose.

In making the necessary *emergency* preparations, the great point is to avoid stirring up dust, which, as we know, is loaded with bacteria. The floor may be covered with a clean sheet, and furniture be covered up in the same way, and, in particular, the less window curtains and blinds are interfered with the better. Windows must be kept closed. Any necessary dusting must, of course, be carried out with a damp cloth.

When a longer time is at the nurse's disposal, the apartment should be prepared in a proper and systematic way, as follows.—The room selected should be airy, well lighted, and as large as may be, and it is convenient to have it as close as possible to the

patient's bedroom. All unnecessary furniture and fittings should be taken away. Walls, ceiling, and floor should be well scrubbed with washing soda, and, if time permit, the walls and ceiling may be lime-washed. Finally, what is needed for the operation, such as a firm table, several small tables for instruments and dressings, bowls for washing, slop-pail, and so forth, are placed in the room. After that, windows must be kept shut, and every precaution be taken to avoid disturbing dust.

Fumigation of the room, to which importance is attached by some surgeons, seems to be unnecessary if the foregoing steps have been taken.

As to other preparations to be made by a nurse prior to operation in a private house, it is difficult to speak definitely, since each surgeon has very different requirements. But she cannot be wrong to provide a couple of new (or sterilised) nail-brushes, soap, basins, and a plentiful supply of towels, with hot and cold water. These are always required. She will do well also to provide a liberal supply of water which has been boiled for five minutes in a covered receptacle and then allowed to get cold, and is thus sterile. Furthermore, it is advisable to have a large kettle, its spout loosely plugged with cotton wool, actually boiling on the fire. Towels for covering instrument tables, etc., are easily sterilised by boiling them for five minutes in soda solution. Basins, bowls, and other utensils, likely to be needed during the operation, are purified in the same way. In this connection the fact may be recalled that

towels fresh from the laundry contain few micro-organisms (Schimmelbusch).

As regards the general preparation of the patient, he should, if possible, be confined to bed for a day or two prior to operation, since the rest thereby obtained is likely to reduce vomiting and disturbance after operation to a minimum. Under any circumstances, he should spend the night before operation in the bed he is to occupy after operation, so as to accustom himself to it. A hot bath is advisable. The urine should be tested for the purpose of ascertaining the absence or presence of albumin and more especially of sugar. Careful watch should be kept for any personal peculiarities, such as a bad cough, a tendency to sneezing, deafness, difficulty with the urine, and so forth, for report to the surgeon. Should a patient have discharge from the ear or nose, the notice of the surgeon should be drawn to the fact, and the same rule applies to any sores that may be present about the face, fingers, or elsewhere, since the eye might become infected if special precautions were not taken in such cases. Another important point is to ascertain the state of the teeth and gums, and to bring a dirty mouth into as clean a state as possible, for some bad results after operation have been traced to neglect of this precaution. In the case of very nervous subjects it is often advisable (under medical directions) to ensure a good night's rest before operation by the administration of some harmless and efficient hypnotic. A mercurial or other purgative pill should be given the night before operation, to be

followed, if necessary, by a dose of mineral aperient water next morning. That failing to act, an enema of soap and water or an injection of glycerine may be given.

Men should be clad in pyjamas and stockings before they are placed upon the operation table, while for women a night-gown and a dressing-gown and stockings are usually worn. For children a warm night-dress of flannel and long stockings are very suitable, or, on an emergency, a wrapping of Gamgee tissue makes an admirable though somewhat expensive substitute. The patient's body, clad in these or other suitable garments, is always covered at the time of operation with sterilised sheets or towels. Nothing is more uncleanly than to have wisps of hair finding their way across the field of operation. The hair in females must therefore be divided into two portions at the back of the head, and then be neatly plaited in two tails (see Fig. 23). In addition, it should be covered by a closely fitting cap of sterilised linen or by a sterilised towel.

Fig. 23. Arrangement of Hair for Operation.

In minor eye operations, such as the epilation of lashes, the passage of a lacrymal probe, the opening of styes, or the removal of foreign bodies, the surgeon usually stands behind the patient, who is placed in a sitting posture. But in the more serious operations, for example, tenotomy for squint,

cataract extraction, or iridectomy, the patient lies flat on his back. This latter case demands some sort of table, with regard to the selection and arrangement of which a few words may be said.

An operating couch (often quite an elaborate affair) will, of course, be at hand in a properly furnished hospital; but in private houses it becomes part of the nurse's duty to improvise a table. For many reasons, an ordinary bedstead is unfitted for the purpose: it is too broad, and the presence of head and of foot rails prevents that ready access which is one of the first essentials of an operating table. Moreover, its lowness entails uncomfortable stooping on the part of both surgeon and nurses. Nevertheless, a patient may at times be too ill to be moved, and in that case the best thing is to place him crosswise or obliquely in the bed, so that the operator may stand at the back of his head.

In choosing a table, the chief points to be borne in mind are the following: the table must be firm; it should be of a proper height, neither too high nor too low (about three feet); and narrow enough to allow people to stretch over it with ease and comfort. A dressing or a library table may be found to answer the purpose, or the long narrow laundry table, which is sometimes used for ironing, and last, but not least, there is always the kitchen table. In fact, if set about in the right way, any household will furnish materials for a makeshift operating table. The surgeon may find the table too high for his purpose, in which case he should be provided with something to stand on,

as, for example, the cork mat so often found in bath rooms.

The table now requires to be fitted up. It should be covered with a couple of blankets, over which are placed in turn a rubber and a linen sheet. Blankets and sheets should be tucked in, or fastened beneath the table with safety-pins, so as to be out of the way. Next, a broad and firm pillow, covered with a square of "hat lining," or "jaconet," as it is called nowadays. It is not a bad plan, in institutions where many eye operations are performed, to cover an ordinary pillow with white mackintosh, and thus to do away with the need of separate squares. In any case, the rubber must be carefully cleansed after use, and should be immersed in a solution of corrosive sublimate (1 in 1000) or of carbolic acid (1 in 20) before it is allowed to dry. Two towels are placed over the waterproof material, and many nurses wrap the upper towel round the patient's forehead and head, so as to restrain his movements if necessary and to keep the hair out of the way. Lastly, a thick blanket is thrown over the body of the patient, covered, in turn, by sterilised sheets or towels.

The pillow should be arranged so as to support the patient's shoulders, and thus to prevent any tendency to unsteadiness during the operation. Small sand-bags are sometimes used to steady a patient's head. In bygone days, previous to the introduction of cocaine, it was customary to use an apparatus, called a "*cephalostat*," which held the head of the patient in a kind of vice

According to the nature of the operation, the surgeon may stand either behind or at the side of the patient.

Most surgeons prefer to operate by diffuse daylight, which can be obtained by placing the couch with its foot towards a moderately high window. The best kind of light is generally held to be that afforded by a bank of white cloud or by a blue sky. An artist's studio is invariably arranged so that the light falls on the easel from a north window, so as to avoid bright sunlight, while a skylight is never allowed. Exactly the same principles may be applied to the management of light for eye operations. Everybody can testify from personal experience that nothing could be worse than a top-light, as it throws troublesome shadows over the field of operation.

Artificial light is sometimes used, and special lamps have been devised. One of the best plans of the kind, albeit rather a clumsy one, is to suspend by a cord a large glass globe, or "bolt head," filled with water, behind which a powerful paraffin lamp is placed. A strong beam of light is thus produced, and by careful focussing on the patient's eye a most brilliant illumination can be obtained. This apparatus is fixed, and it is therefore necessary to shift the couch to right and left, according to the eye which is to be operated upon. Upon the whole, however, a portable electric or paraffin lamp, of which there are many on the market, will be found the most convenient in a private house.

The air, as we know, swarms with various kinds of germs in the form of dust. The question naturally

raises whether our operation wounds will not be contaminated with organisms from that source. In the earlier days of antiseptic surgery, elaborate precautions were taken to guard against the entrance of atmospheric germs. To effect that object, operations were conducted under a cloud of carbolic spray, which enveloped both operator and patient. Somewhat later, the spray was replaced by a continuous stream of antiseptic solution, which was made to drip steadily upon the wound by a method known as "irrigation". At the present time, however, neither spray nor irrigation is used. As a matter of fact, the surgeon has learnt from experience that he may practically disregard the action of dust-borne spores, and he now fears those forms of septic material only which may be introduced into a wound by uncleanly fingers or skin, by dirty instruments, by septic "drops," by germ-laden sponges, or by imperfect dressings.

In some hospitals a nurse may be required to prepare the instruments for an operation, a task which involves a good deal of responsibility. Modern research has conclusively shown that operation wounds are often infected by means of septic material introduced upon the instruments of the surgeon. An instrument may be "clean," in the ordinary sense of the word, and yet quite unfit to be brought into contact with an eye. It may, for example, be literally loaded with organisms, already described under the names of micrococci and bacteria (Chapter II.). Some of these, it is true, are harmless, but others are capable, when introduced into the human body,

of setting up serious inflammatory mischief. It is in view of these facts that we employ antiseptics and other means to destroy all septic organisms that may happen to be upon our instruments.

Among these agents, one of the best is undoubtedly a 1 to 20 solution of carbolic acid, in which the instruments may be soaked for some time—say, ten minutes before an operation. Surgical instrument makers sell neat trays (Fig. 24) of porcelain or of vulcanite to hold eye instruments, but an ordinary china meat dish, such as can be obtained in any

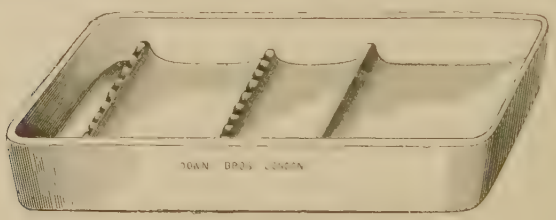

Fig. 24.

Tray with Racks for Carbolising Instruments.

house, will answer every purpose. In hospital, an enamelled iron plate or photographic tray is often used. To resume: the receptacle is half filled with 1 in 20 carbolic lotion, in which the instruments are placed so that every part of them, including the handles, is immersed in the fluid. Lastly, the dish, covered with a piece of plate glass, is laid aside until required.

Cyanide of mercury has been strongly recommended in the form of a 1 per cent. watery solution, into which instruments are placed for ten minutes. It is claimed for this fluid that it damages neither the polish nor the temper of steel instru-

ments, even when they are immersed in it for some hours, while its antiseptic properties are most powerful. Indeed, the cyanide appears to be an ideal antiseptic for the purification of instruments.

From either of the foregoing solutions the disinfected instruments should be passed into some indifferent fluid, which will not irritate the sensitive eye. Such are sterile water or salt solution (0·6 per cent.), boric lotion, or carbolic lotion (1 : 100). They should be boiled immediately before use. Many surgeons, however, now prefer to *use* their instruments dry, in which case they are wrapped in sterile gauze after immersion in the indifferent fluid.

Boric acid or corrosive sublimate solution should not be used for purposes of disinfection. The former because its antiseptic properties are not sufficiently potent; the latter because it disfigures the surface of steel instruments with lasting stains, besides blunting them.

Some surgeons rely upon the antiseptic virtues of ether or absolute alcohol, and are in the habit of dipping their instruments into these fluids before immersing them in carbolic lotion. The precaution, however, is hardly necessary. At the same time under certain circumstances, as, for instance, when carbolic acid cannot be obtained, we may avail ourselves of the disinfecting properties possessed by alcohol. Thus, instruments may be dipped in whisky—which, for all practical purposes, is alcohol—and thereafter laid in water (which has been sterilised by boiling) until the moment of operation.

A high temperature, as the nurse has already learnt, destroys micro-organisms, and this fact is taken advantage of in modern ophthalmic work. For instance, steam sterilisers have been introduced by Bronner, Cathcart, Schimmelbusch, T. H. Butler, and others. All objects to be purified are placed on trays, and enclosed in the apparatus, which is then filled with steam.

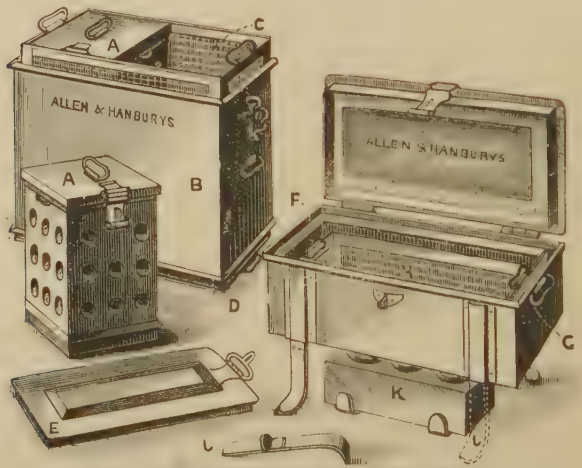

FIG. 25.—SCHIMMELBUSCH'S STERILISER.

One of the most convenient *Sterilisers* for eye instruments and dressings goes by Schimmelbusch's name, and is shown in Fig. 25. Instruments are sterilised by solution of soda (1 per cent.), and dressings by steam arising from the boiling soda solution. The lower part of the apparatus (C) is half filled with the soda, and this liquid is boiled by means of the spirit-lamps (K) placed below the box. Coarse instruments, such as speculum, forceps, or probes,

are put in the tray (H) and immersed in the boiling solution for three minutes, but cutting instruments, as cataract or iridectomy knives (if boiled at all), should not be exposed for more than one minute at the outside. The sterilised instruments are then lifted from the soda solution by means of the wire tray (H), and placed in any aseptic liquid until needed for use. Such liquids are—water that has been boiled for five minutes or filtered through a Berkefeld or Chamberland filter, or solution of common salt (0·6 per cent.) or saturated boric acid lotion similarly boiled. In order to sterilise dressings and cotton-sponges and bandages, the latter are placed in the metal boxes (A, A), which have large perforations at the side to admit steam freely. These containers are put in the chamber (B), which is then covered with the lid (E). The chamber (B) is fitted over the boiler (C), and steam from the latter ascends through a wire mesh on the under surface of B. Dressings are usually sterilised for half an hour. They are kept from subsequent contamination in the metal boxes (A, A) by closing the perforations by a simple sliding contrivance.

Owing to the effect of boiling solutions in dulling the edges of some of the delicate knives used in eye-work,[1] some surgeons still prefer to sterilise the last-named by immersing them in carbolic lotion (1 : 20) or cyanide of mercury solution (1 : 100) for

[1] All ophthalmic surgeons are not agreed upon the point. Some very competent men, as Fuchs and Elschnig, believe that even delicate knives are not damaged by boiling. But much depends upon the temper of the blade.

ten to fifteen minutes or in lysol (1 : 10) for half an hour. They are then transferred to sterile water or salt solution until actually needed for use, unless it is preferred to use them dry.

In private practice, however, a steam steriliser would not be available, and so a simpler plan of disinfecting instruments by heat must be resorted to. A fish kettle (or other convenient receptacle) is half-filled with 1 per cent.[1] soda solution, the kettle is put upon the fire, and when the liquid is actually on the boil, as the saying goes, the instruments, held in a piece of gauze, are lowered into it. The larger and coarser instruments, as specula, retractors, probes, squint hooks, and so forth, should be exposed to the action of the boiling soda solution for at least two minutes. But it must be remembered that so prolonged an action is apt to injure steel and to dull the cutting edge of knives. For such instruments, therefore, an exposure of from thirty to sixty seconds is adequate. From the boiling soda solution the instruments are lifted by the gauze and a sterilised pair of clutch forceps, and transferred for a few moments to sterile water or saline or to weak carbolic acid lotion (1 : 100). Some surgeons use them direct from those liquids, but most nowadays prefer to use them dry. In order to secure this, they are simply laid in order upon a surgically clean towel, or allowed to cool, wiped with a piece of sterilised gauze, and used by the surgeon. More simply still, if placed on racks in the sterilizer

[1] Roughly, one heaped tablespoonful of *washing soda* to each pint of water.

they can be lifted out on to the towel, and for all practical purposes become dry without further ado.

One drawback to the sterilisation of instruments by boiling, namely, the liability to rust, may to a large extent be avoided by attention to two or three simple precautions, as follows.—First, plain water should not be used; secondly, instruments should not be immersed in the soda solution until the latter is actually on the boil; and, thirdly, contact between the metal of the boiler and the steel of the instrument should be avoided by placing a piece of gauze or other material between them, in order to prevent galvanic action.

Instruments, however clean in the first instance, may readily become contaminated during the course of an operation, as by touching the patient's hair or by falling upon the floor. They must be sterilised anew. This may be most readily done by picking up the soiled instrument with a pair of sterile forceps, and holding it for a minute or so in a can containing boiling water, which should always be ready during an operation against such an emergency.

After operations, instruments must be *carefully* disinfected, cleansed, and dried. The teeth of forceps and the joints of scissors should be scrubbed with a brush reserved for that purpose and sterilised at frequent intervals. Such instruments as iris forceps and cystitome need special attention, and so indeed do any instruments the surface of which is rough enough to harbour infective material. Knives, needles, and other edged or pointed instruments should be washed separately, as otherwise

its turn by boiling in soda solution. The brush should be kept in a covered glass trough constantly immersed in corrosive sublimate, 1 : 1000 or 2 per cent. solution of lysol. As a further safeguard, the hands must be purified by immersion for several minutes in a hot solution of corrosive sublimate (1 : 1000).[1] By many surgeons an alcoholic solution of biniodide of mercury is preferred to sublimate for disinfecting the hands.

The practical difficulty in disinfecting the hands properly has led many general surgeons to use india-rubber or cotton gloves whilst operating, more especially upon septic cases. Owing to their interference with the delicacy of touch necessary in operations upon the eye, however, they are not worn by ophthalmic surgeons, although there is much to be said in favour of their use by those who merely assist as nurses. In the Prague Eye Klinik, a nurse is not allowed under any circumstances to handle sterilised instruments, etc., with the bare hand (Ernest Thomson), a rule I always adopt in my own work.

The patient himself must be regarded as a third possible source of contamination. Organisms may exist in the skin of the face or the eyelids, in the cavity of the conjunctiva, or more especially in the lacrymal sac. As to the skin, the first thing to do is to make a liberal use of soap and hot water. Instead of common soap, some surgeons for this

[1] Before the hands are steeped in sublimate, every trace of soap must be got rid of, since the presence of even a small quantity of soap renders the sublimate more or less inert (R. Boxall).

purpose employ spirit soap—*i.e.*, an alcoholic solution of soft soap, or ethereal soap—*i.e.*, a solution of soft soap in methylated ether. This is followed by sublimate, .1 in 5000, applied to the parts in the form of wet compresses, which are placed over the lids and neighbouring parts for an hour or so before operation. During these various precedures, special attention should be paid to the eyelashes, which often seem to harbour infective micro-organisms. Indeed, before the more serious operations, as cataract, the lashes are clipped close by some surgeons.

Not so very long ago, it was usual to wash the skin of the eyelids and to disinfect the conjunctival sac with sublimate (1 : 5000) on the eve of the operation, and then to keep the eye tied up until next morning. On removing this "test dressing," as it was called, the eye was regarded as fit for operation only if no discharge were found on the pads. In the contrary event, the operation was postponed, and treatment of the eye was carried out. A simpler plan is, however, now more popular.—For two or three days prior to the operation, the eye is washed several times a day with some non-irritating fluid, as normal saline or boric lotion. It is not bound up. On the morning of operation the skin of the eyelids and neighbouring parts is cleansed with soap and hot water, often preceded, particularly on the Continent, by the use of a little benzine to remove grease from the skin. The conjunctival sac is usually cleansed by a stream of warm saline (0·6 per cent.), boric acid (saturated) or sublimate (1 : 5000) directed from an "Undine". Care

must be taken to remove any matter that may have collected in the corner of the eye. When any discharge can be squeezed from the lacrymal sac, operation is generally postponed, for every practical surgeon now recognises the risk of sepsis that is added by the presence of such a complication. It is, indeed, by far the most serious cause of contamination in eye operations that can well be met with.

While the patient is actually on the table, some surgeons go over the parts again with soap and water, and wash out the conjunctival sac with saline or other lotion. For my own part, I content myself with painting the skin of the eyelids, cheek, side of the nose, and brow with tincture of iodine whilst the patient lies on the operating table.

Many surgeons like to have the patient's face covered with a single fold of sterilised gauze, having a hole cut for the eye to be operated on.

We have not yet exhausted the more obvious means by which septic organisms may be introduced into the eye, for sponges—a most fertile lurking ground for bacteria—remain to be considered. Formerly, little attention was paid to the cleansing of sponges, but in the earlier days of antiseptic surgery they became the objects of the most solicitous care. Of late years, however, there has been a general tendency to abolish the use of sponges altogether in eye, as in most other, operations, and to replace them by small finger-shaped pieces of absorbent cotton-wool, Robinson or Gamgee tissue, or absorbent butter muslin or gauze, which have been steamed for

half an hour in the steriliser. These swabs, or "cotton-sponges," are not equal to sponges in their absorbing powers, but any loss in that direction is more than outweighed by the gain in surgical cleanliness.

Lord Lister, who, as everybody knows, was the greatest living authority upon antiseptic matters, treated his sponges after an operation by washing them thoroughly, first in soap and water, and then in soda; after which they were dried, and finally stored away in a solution of 1 to 20 carbolic acid. As regards private operations, Lord Lister simply threw his sponges after use into a tank of water, where they were allowed to putrefy. They were then washed until the water squeezed from them was no longer reddened, and were afterwards put away in carbolic lotion. According to Lister, either plan will render sponges absolutely aseptic and trustworthy.

The following method, although somewhat more complicated, is an excellent way of purifying sponges. Mix two ounces of a saturated solution of permanganate of potash with about a quart of water, and place the sponges in the mixture. Allow them to remain in the liquid for about half an hour, after which they are put into the following liquid: diluted hydrochloric acid, one ounce; hyposulphite of soda, half an ounce; water, one quart. They are left in the latter fluid until they turn white, and look like new sponges, when they can be stored away in 1 to 20 carbolic lotion. A large earthenware pickle jar, plugged with cotton-wool, and covered with

gutta-percha tissue, forms a convenient storage tank for sponges.

If no chemical antiseptic be obtainable, sponges may be sterilised by boiling them in water, and they should be then kept in boiled water until the moment for operation arrives. It appears, however, that a sponge thus treated undergoes a peculiar change, resulting in partial loss of its power of absorption, and when dry, it becomes "perfectly hard, like a piece of wood" (Maylard).

Notwithstanding the superior absorptive powers of sponges, they are nowadays practically always replaced by swabs of absorbent wool or gauze or of Gamgee tissue in ophthalmic, as in general, surgery. Saturated boric acid solution or normal saline solution may be used to moisten these pledgets (after sterilising), which must then be squeezed dry by a nurse whose hands have been carefully purified and who wears sterile rubber gloves. After that, the swabs are laid aside wrapped in a sterilised towel, or they may be stored in a glass jar which has been well washed out with an antiseptic lotion or boiled, and which is kept closed at the top with a piece of sterilised glass. The swabs may be made of various sizes, and should be large in operations which involve relatively much bleeding.[1]

Bernay's "compressed sponges"—that is, thin discs of compressed absorbent cotton-wool—are con-

[1] On the Continent cotton swabs are often fixed on the end of small glass rods, so that the surgeon's fingers do not come into direct contact with the sterile wool.

venient in operations in private houses. When placed in hot water these artificial sponges swell up, and make excellent substitutes for the ordinary swab. Swabs of cotton-wool are, of course, used once only, and are then thrown away.

Silk ligatures are often needed for eye operations. They may be purified in various ways, one of the simplest of which is to boil them thoroughly in water. A neat little reel of glass, introduced by Messrs. Reynolds and Branson, of Leeds, is shaped like a Maltese Cross (Fig. 27), so that the innermost layer of silk can be the more easily acted on by the boiling water. The silk is wound around the reel, and placed in the water. A few minutes' exposure is enough to destroy all disease-germs.

Fig. 27.
Glass Reel.

Another plan is to keep the silk in a 1 to 20 carbolic lotion, but the nurse should remember that immersion for any length of time in that acid tends to spoil the silk by making it brittle. Black silk is generally selected for eye work, because that colour is easier to distinguish than others.

Specially prepared catgut or horse-hair sutures are also occasionally used; but silver wire, on the other hand, finds comparatively few applications in eye-surgery.

Instruments, however clean in the first instance, may become readily polluted if permitted to touch any unpurified object, such as the table or articles of clothing. Hence, one or more towels, wrung out

of 1 in 20 carbolic lotion, or, better, sterilised in steam or boiling soda solution, should be close a-hand, so that the operator may lay down his instruments on their aseptic surface. A towel prepared in the same way is laid over the table on which the instruments are arranged before operation, and they should be covered with another towel, so as to be out of the patient's sight.

All vessels should be cleansed by boiling or the use of antiseptics. On an emergency, however, a dish or bowl may be sterilised by pouring a little methylated spirit into it, and then igniting the spirit. This will effectually cleanse the surface. Indeed, the rules observed in the operations of general surgery apply equally to those performed upon the eye. Thus, the nurse should take care to have plenty of spare basins, a good supply of cold and of hot water, towels, sheets, and dressings.

All tissue, tumours, lenses, eyeballs, etc., removed by the surgeon must be carefully preserved.

CHAPTER IX.

DRESSINGS AND BANDAGES.

Dressings.

It is clear that the pains we have previously taken to purify instruments, fingers, and cotton-sponges will be thrown away if septic material be allowed to reach the wound after operation. Some sort of dressing is therefore necessary to cover the eye after many operations. Its object is twofold: first, to protect the eye from injury; and, secondly, to prevent the entrance of micro-organisms.

As to any particular dressing, the nurse will naturally be guided by the surgeon in charge of the case. The applications described below are, however, in common use, and their details should accordingly be mastered.

An eye-pad, which is the basis of most dressings, is made in the following way.—Layers of absorbent wool are cut to a circular pattern, measuring about three inches across, and one to one and a half inches in thickness. The exact size must, of course, be determined by the size of the patient's face, but the dimensions named may be taken as about correct for an adult patient of average stature. Old linen or

fine cambric, which has been thoroughly boiled and dried, is then shaped in a corresponding way, and a single disc of that material placed on each side of the wool pad. Some nurses stitch the two pieces of linen together, but that is hardly necessary. Sterilised Gamgee tissue, cut to a proper shape, makes an admirable eye-pad, which may well replace the absorbent wool and old linen. Robinson's "cellulose gauze tissue" is another material of the same kind.

The completed eye-pad, then, consists of two rounds of linen or gauze, enclosing a thick wad of absorbent wool.

A word of caution may be here inserted.—Cotton-wool itself should not be placed next to an eye, because its fine fibres are apt to find their way between the lids, and thus lead to discomfort and irritation. Lint, although still employed by some oculists, is open to a similar objection. On the other hand, the coarse muslin known as "butter-cloth," or gauze, makes a most excellent dressing for eyes. It is soft, pliable, absorbent, and very comfortable to the patient. Indeed, the pad may consist wholly of gauze cut to a proper shape; or, while cotton-wool forms the bulk of the pad, several layers of gauze may be placed next to the lids instead of the linen or cambric. By chemical means butter-cloth, like wool, may be rendered absorbent, and thus prepared it may be impregnated with any of the antiseptics named above.

Simple Aseptic Dressing.—Nothing more is required than an eye-pad of sterilised gauze or Gamgee

or Robinson tissue placed over the closed lids, and kept in position by a couple of turns of sterilised bandage passed round the head. This is now the dressing most commonly employed by surgeons. Nothing more is needed in the majority of cases, or used by the majority of surgeons.

The following *Antiseptic Dressings* do not enjoy nearly as much popularity with ophthalmic surgeons now as they did but a few years ago:—

Iodoform.—The closed lids are lightly smeared with iodoform-vaseline (iodoform one to vaseline ten parts), and some of the same substance is spread over the linen of the eye-pad. Iodoform wool is used in the latter. A bandage will complete the dressing.

Boric Acid.—The ointment of the British Pharmacopœia, which contains one part of acid to six parts of vaseline, is smeared over the lids and the eye-pad, as in the iodoform dressing. Boric wool is employed in the eye-pad. Another method consists in moistening a piece of green protective with a saturated solution of boric acid. This, placed over the lids, is covered with a pad of boric wool, wetted with the same lotion. A third plan directs boric acid ointment to be spread on old linen, which is then applied and covered in with ordinary absorbent wool.

Alembroth.—For this dressing an eye-pad is used of alembroth wool and gauze. The latter should be damped with 1 in 100 carbolic lotion before it is placed in contact with the lids.

Perchloride of mercury.—The lids are covered with several layers of fine linen soaked in 1 to 5000

solution of the salt. A piece of protective or gutta-percha tissue, previously dipped into the lotion, is then laid upon the linen, but care must be taken that the tissue is somewhat smaller than the linen, or else the result will be a poultice rather than a dressing. An eye-pad, or several layers of cotton-wool, is next placed over the protective; and, last of all, a bandage is applied. Some surgeons use lint instead of linen, but, for reasons already stated, personally, I prefer the latter.

Mercuro-zinc cyanide.[1]—The circular pieces of linen are charged with this antiseptic, while the cotton-wool is treated in a similar way. The dressing should be moistened with a 1 in 100 carbolic lotion before application. Perchloride lotion must on no account be substituted for the carbolic, as it enters into chemical union with the cyanide to form a compound which is not only highly irritating, but is almost powerless against bacteria.

As already said, dressings may be made entirely

[1] Mercuro-zinc cyanide was introduced by Lord Lister, and appears to have many advantages. It is almost unirritating, and is an exceedingly powerful antiseptic. Gauze may be charged with it at a moment's notice in the following way.—Absorbent gauze is soaked in a 1 to 20 carbolic lotion, and the mercuro-cyanide is dusted over it from a pepper-castor. The gauze is then rolled and squeezed together, so as to diffuse the salt through the material. Lastly, the wet gauze is wrapped in a folded sheet to get rid of superfluous moisture, and it is then ready for use (*British Medical Journal*, January and February, 1893). The fact may be noted that, besides staining the fingers, the above solution makes the skin rough. A nurse should, therefore, wear a pair of gloves when preparing the gauze.

of absorbent gauze. That material, medicated with iodoform, boric acid, alembroth, perchloride, or mercuro-zinc cyanide, may be arranged in a circular pad of some thickness, which is placed over the eyelids, and held in place by a bandage.

In applying any of the above dressings a nurse must always take care to fill up the hollow of the orbit by adding bits of wool or gauze here and there until a level surface is obtained. If this precaution be neglected, the patient is almost certain to complain sooner or later that the dressing is uncomfortable. Moreover, harm may result from unequal pressure upon the eyeball.

The discharge from bandaged eyes is generally small. If, however, it should soak the dressing and show outside, the nurse must take prompt steps to prevent the contamination of the wound. Organisms experience no difficulty in making their way along a track of this kind, from which the discharge has washed away and exhausted the original antiseptic of the dressing. Accordingly, as soon as the nurse sees a soaked dressing she should dredge iodoform over it externally, and then apply a pad of antiseptic wool and a fresh bandage.

Materials used for dressings should be stored away in air-tight receptacles, and should be handled only by fingers that have been purified. Personally, I use a japanned iron deed-box for this purpose, but a biscuit-tin will be found to answer well enough for private work, and a small tin trunk for the wards. In any case the receptacle

must first be well scrubbed with 1 in 20 carbolic lotion.

To change a dressing.—The patient, if not already in bed, should lie down, and the nurse should arrange sterile towels under his head and shoulders. A tepid lotion of common salt (0·6 per cent.), boric acid, or corrosive sublimate (1 : 5000) is used. A number of small squares of sterilised lint or of Gamgee or Robinson tissue, called "guards," are placed ready at hand in whatever lotion may be selected. They are intended for three purposes : first, to wash away the soiled dressing ; secondly, to wipe off discharges ; and thirdly, to protect the eye while surrounding parts are being cleansed. An "Undine" may be used to loosen and to wash away the dressing.

The bandage having been removed, the wool of the eye-pad is soaked with lotion and taken away piecemeal with purified dressing forceps. Lastly, the piece of linen which forms the deep dressing is washed from the lids by means of a well-directed stream of lotion from the "Undine". The patient should be cautioned not to start suddenly, nor to attempt to open the lids until told to do so. During these proceedings anything like pulling or dragging must be carefully avoided. Discharge is to be wiped off gently by means of a guard, and the roots of the lashes are cleansed in the same way. The lids are next drawn gently apart, and a little lotion is allowed to enter the conjunctival sac. The final steps are to protect the eye with a guard, and to purify the surrounding skin. The opportunity should now be

taken of brushing the patient's hair, a little attention for which, as a rule, she is most grateful.

Soiled dressings and guards must be at once thrown into a separate basin, and the instruments, as well as the fingers of all concerned, must be carefully purified after each fresh exposure.

BANDAGES.

Bandages.—The bandages used in eye work may be considered under two heads, namely, special and roller bandages.

SPECIAL BANDAGES.

Special forms of bandage are extensively used in ophthalmic cases, more especially after the operation for cataract.

The "*tie bandage*" is the simplest of all and by no means the least satisfactory. This is essentially *the* bandage for out-patients. It can be taken off in a moment and be applied again as quickly. It is light, and, when well applied, comfortable. It is merely a piece of calico or water-dressing bandage, two to two and a half inches wide and about fifty inches long, which covers one eye, and is tied either behind the patient's head or, better, crossed, and its ends tied over his forehead (Fig. 28).

FIG. 28. TIE BANDAGE.

Another pattern well suited for covering one eye has recently been described by an American surgeon, Dr.

Z. C. Layson. It is shown in Figure 29. It can be made from a piece of gauze roller bandage, two and a half to three inches wide. The crossed strips shown

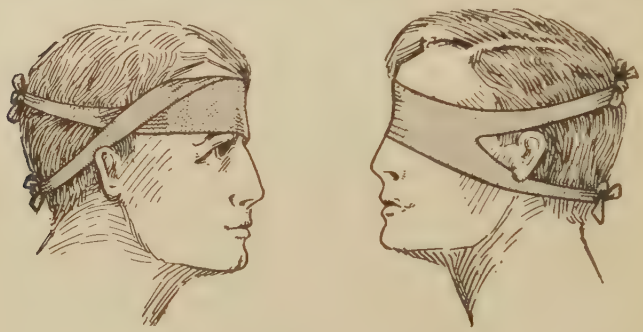

FIG. 29. LAYSON'S BANDAGE.

in the figure prevent the bandage from slipping too far on the side of the eye left open.

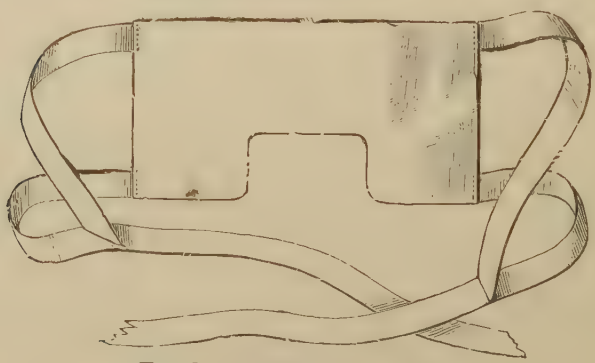

FIG. 30. MOORFIELDS BANDAGE.

Figure 30 represents the "*Moorfields eye bandage*," made of a double fold of linen, seven or eight inches

in length and three in breadth. The bandage may be described as consisting of two squares joined together by a narrower strip which fits spectaclewise over the bridge of the nose. The four tapes are arranged so as to form two loops, into which the ears fit when the bandage is applied. The loops terminate in free ends, which are crossed behind the head, brought forwards, and tied in a knot over a pad of wool placed on the forehead. This bandage is specially

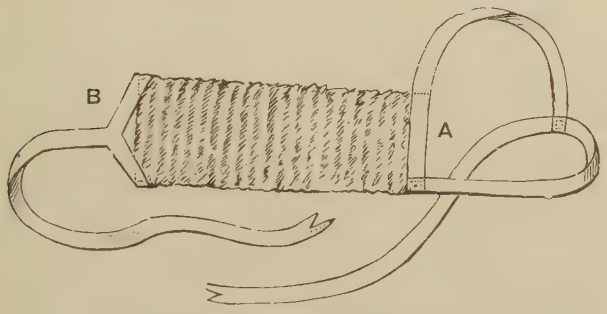

Fig. 31. Liebreich's Bandage.

useful after cataract operations, since it can be removed without disturbing the patient.

Liebreich's bandage (Fig. 31) may be thus described.—Let A and B be the two ends of a linen or knitted cotton band, ten inches long and two and a quarter inches wide. From one end A a long tape passes round the back of the head, and is fastened to a second short tape from end B. The bandage is kept from slipping downwards by a third piece of tape, passing from ear to ear, and fastened at both

ends to the long tape from end A. In applying this bandage the tapes are fastened on one temple, the right if the left eye has been operated on, and *vice versâ*.

Personally, I often use a simple bandage which can be made in a few minutes from a piece of Saxony flannel or domette. As shown in Figure 32, its shape resembles a dumb-bell, the handle of which passes

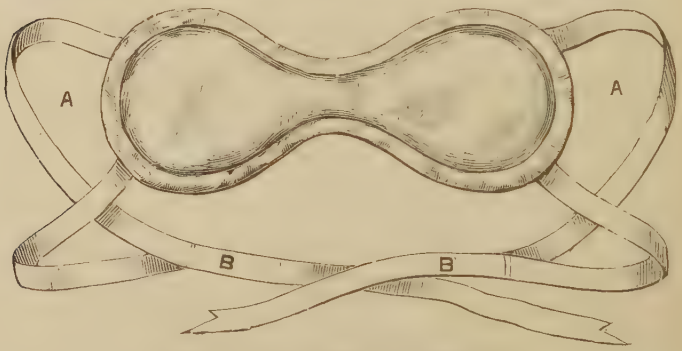

Fig. 32. The Dumb-bell Bandage.

over the nose, while the expanded ends fit over the eyes. This covering piece is fitted with two tapes, an inch in width, which are passed around the ears and round the head, to be tied together on the forehead over a dossit of wool. One may speak of this homely little contrivance as the "Dumb-bell Bandage".

The nurse should bear in mind that bandages are sometimes applied to the eye for purposes of pressure as well as of protection. The pressure bandage is used, for instance, to check bleeding when an eyeball

has been removed, to prevent the ecchymosis of blood after a squint operation, or, curious though this may seem, when an ulcer has almost penetrated the cornea. The protective bandage, on the other hand, is applied to keep the lids immovable after such operations as iridectomy or cataract extraction, and also in some cases of ulceration of the cornea. It would be a grave error to bandage an eye tightly after the anterior chamber has been opened, because pressure would be likely to prevent the wound from closing, and thus complicate matters seriously. It will be seen that all the special forms of bandage are for the sake of protection rather than of pressure.

Roller Bandages.

The ordinary roller bandage, as every one knows, is made by tearing unbleached calico into strips of various lengths and widths. For the eye, a width of one and a half or two inches is sufficient, while the length of the roller need not exceed three yards at the outside. Calico bandages, however, are scarcely suited for the majority of eye cases; they are hot and heavy, and do not adapt themselves at all readily to the inequalities of the skull and the orbit. Consequently, bandages of other material, such as muslin, gauze, or domette, are generally preferred. The best bandage is made of the open-wove stuff sold as bleached or unbleached "water dressing" or "Lister" bandage. Of the two varieties most persons prefer the bleached, notwithstanding the fact that the other is a good deal cheaper. As to the borders of the bandage it is of little importance whether they be loose or

finished off with a "selvedge". The nurse should make it a rule, by the way, to brush the patient's hair both before and after the application of any kind of bandage to the head.

The following methods of applying roller bandages should be diligently practised :—

1. Let us suppose that it is necessary to bandage the right eye after operation. The nurse stands in front of the patient, holding the bandage in her right hand. She next places the roller on the centre of the patient's forehead, and secures its end with her left thumb. The bandage is then carried to the patient's left, round the skull to the forehead, where it overlaps and fixes the free end left upon starting. A second turn is made around the head as far as the middle of the back of the skull, when the direction of the bandage is changed so as to bring it under the right ear, and upwards over the cheek to cover the right eye. The roller is then cut short, and the loose end securely fastened to the bandage on the forehead by

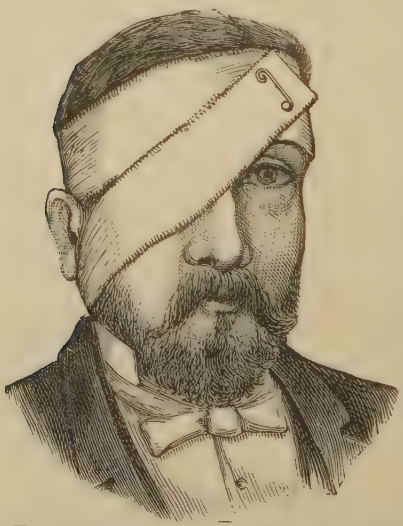

Fig. 33. Roller Bandage Applied to One Eye.

a safety-pin (Fig. 33) or a couple of modern paper-clips. Concerning this bandage, two points may be noted: (1) that the eye is covered by a single fold only; and (2) that in bandaging the right eye the roller is at first carried to the patient's left, and *vice versâ*. This bandage possesses a great advantage over most others, in that the patient's head need not be raised from the pillow when changing dressings; one has merely to unpin and throw down that part which closes in the eye.

2. By a slight modification of the foregoing bandage both eyes may be covered. After the safety-pin or the paper-clips have been inserted the roller is reversed, it is then carried downwards across the opposite eye and beneath the ear on that side to the back of the skull, from whence it is brought round to the forehead and secured by a second safety-pin.

3. Figure 34 represents the figure-of-eight applied so as to cover one eye.

4. The figure-of-eight covering both eyes is shown in Figure 35.

We have now seen how to apply our dressing and bandage, but in certain cases the bandage must be more securely fixed. It is of course easy to fasten the bandage by inserting one or more safety-pins[1] or by stitching the various folds together. A much better plan, however, is to cover the bandage with

[1] When both eyes are bandaged, one only having been operated on, it is a good plan to insert the safety-pin on the side opposite to the operated eye. In this way, no confusion is likely to arise as to which is the operated eye when the parts are about to be dressed.

a thin layer of boiled starch, and, indeed, with children, or unruly patients, this precaution should generally be taken.

The fact should be emphasised that ordinary pins must not be used to fasten a bandage; safety-pins should always be employed.

FIG. 34. (AFTER DE SCHWEINITZ.) FIGURE-OF-EIGHT BANDAGE APPLIED TO ONE EYE.

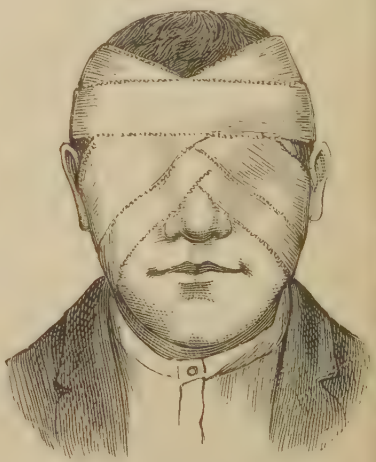

FIG. 35. (AFTER DE SCHWEINITZ.) FIGURE-OF-EIGHT BANDAGE APPLIED TO BOTH EYES.

Indeed, it is now a common practice, especially in Germany, to fix the eye-pad in place by cross strips of half-inch adhesive plaster, and to dispense with a bandage altogether. Seabury's oxide of zinc adhesive plaster is excellent for the purpose. To remove the plaster, benzine, hydrogen peroxide, ether,

and turpentine, are all employed; but oil of wintergreen is much better (Beardsley). It quickly makes its way through the fabric and dissolves the adhesive ingredients of the plaster.

In conclusion, it may be said that a light protective frame of copper gauze is useful for children, who are apt to meddle with their dressings, or with old people, who may become unruly after an operation upon the eyes. The apparatus is placed over the

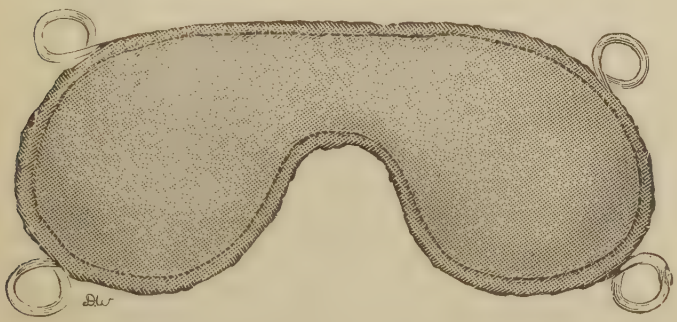

FIG. 36. PROTECTIVE WIRE FRAME.

eye-pad, and takes the place of an ordinary bandage. It is kept in position by means of four tapes tied at one end into the eyelets, their other end being passed round the head and fastened. Figure 36 represents the frame which I have employed for many years.[1] It can be readily bent to any required shape, and its structure allows of its being scalded in boiling water for purposes of disinfection.

[1] This frame is made in three sizes by Messrs. Down Bros., St. Thomas's Street, S.E.

A somewhat similar contrivance goes by the name of Snellen's Shield, a concave disc of aluminium, shaped so as to fit over the eye. An eye-pad is placed over the closed eyelids, and the shield is then fastened in position by a couple of pieces of strapping arranged to cross diagonally. An improved form of

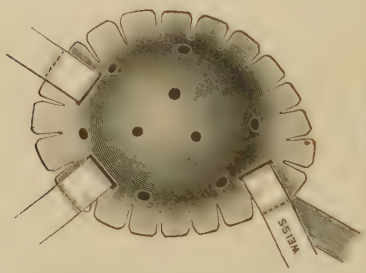

FIG. 36A. WEISS'S ALUMINIUM CATARACT SHIELD.

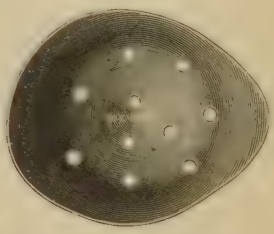

FIG. 36B. CARTELLA SHIELD.

shield, known as "Weiss's Aluminium Cataract Shield," is shown in Figure 36A. A separate shield is employed for each eye. Paste-board or *papier-maché* masks, such as the one designed by Dr. Ring, or that which goes by the name of the "Cartella Shield" (Fig. 36B), are also employed to cover the eye after operations. They are applied exactly in the same way as the Snellen Shield, and are thrown away after use.

CHAPTER X.

NURSING OF OPERATIONS UPON THE EYEBALL.

For present purposes we may divide operations into two groups : those which deal with (1) the appendages of the eye (lids, muscles, and tear apparatus), and (2) the eye itself.

(1) Operations upon the Appendages of the Eye.

Operations involving the nasal duct and tear passages need no dressing, and are usually performed in the out-patient room, remarks which apply equally to the removal of tarsal cysts.

Excision of the lacrymal gland requires some form of aseptic dressing, and in hospital practice the patient would be admitted to the wards. The same remarks apply to excision of the lacrymal sac, nowadays often undertaken for the cure of obstinate watering of the eye.

The operations for entropion, ectropion, trichiasis, and ptosis may or may not require a special dressing, according to the method employed and to the practice of the surgeon. It is hardly possible, therefore, to give precise directions with regard to

their after-treatment. Generally speaking, the nurse must be guided by the orders of the doctor.

After the surgical treatment of trachoma by "EXPRESSION," no dressing is employed, but the lids are fomented with hot boric lotion or saline for half an hour to encourage bleeding. When the more severe operation of "BRUSHING THE CONJUNCTIVA" has been resorted to, it is customary to use iced aseptic lotions, such as boric, which are kept constantly applied to the lids until inflammatory symptoms have subsided.

Surgeons differ in their after-treatment of simple TENOTOMY or "cutting" for squint. Some cover both eyes with a pad and bandage for half an hour only, while others leave a similar dressing in place for twenty-four hours; and others, again, discard dressings altogether. In any case the operated eye is almost never bandaged alone. Most English oculists adopt the first plan with the idea that the presence of the bandage will prevent excessive effusion of blood beneath the conjunctiva. On the other hand, they cover up with an aseptic dressing for some days an eye on which MUSCULAR ADVANCEMENT has been performed. Some surgeons, myself among the number, prefer to bandage both eyes for a week after this operation, even although one alone has been operated upon. Unless they have come away of their own accord before that time, the stitches are removed three or four days after operation. Dressings are changed daily, and on each occasion the eye is cleansed with tepid boric or saline lotion.

(2) Operations upon the Eyeball.

The nurse should clearly distinguish between two sets of operations: A, those performed outside the eyeball; and, B, those in which the eyeball is opened.

A.—When the eyeball has not been opened.

Under this head we include the scraping or cauterisation of infective corneal ulcers, enucleation of the eye, and exenteration of the orbit.

The after-treatment of an ulcer that has been burnt or scraped is simple enough. Iodoform,[1] iodol, or aristol is dusted over the cornea, atropine is used, and a sterilised pad and bandage are applied.

Enucleation of the Eye.—As soon as the operation is complete, bleeding is checked by pressure for a few moments with pieces of sterilised gauze or Gamgee tissue or by irrigation with some aseptic lotion. This is followed by the application of an aseptic dressing, which is renewed in six hours. In my experience, a roller is better than any form of special bandage after enucleation. The patient would, of course, be put to bed, and be given light diet for a day or so.

Rarely, bleeding sets in some little time after operation, and the nurse must be on her guard against such an accident especially in elderly patients. This "re-

[1] Two kinds of iodoform—the powdered and the precipitated—are sold. The former, the powdered, is the best to use, as it does not clot upon the cornea.

actionary" hæmorrhage, as it may be called, is much the same thing as that which sometimes occurs within twenty-four hours of an amputation, for instance, of the thigh or forearm. Should it set in after enucleation of the eye, treatment should be carried out on the following lines.—First, the nurse should apply more pressure by means of an additional bandage. Should she fail to arrest the flow by that means, she must at once remove the dressings—using strict aseptic precautions—and syringe out the clots from the orbit with iced perchloride lotion or with peroxide of hydrogen or with very hot (110° F.) boric lotion. Bleeding will then almost certainly cease, while recurrence will be prevented by the application of a firm pad and bandage. In the event of further difficulty, it would be necessary to send for the surgeon.

A few cases of meningitis have been recorded after enucleation, especially when the eye contained pus. Headache, rigors, vomiting, or increased temperature should be regarded with suspicion, and the attention of the surgeon be at once called to the existence of such symptoms.

If all go well, the wound left after enucleation heals by primary union, without the formation of pus, in five or six days. The orbit should be syringed out daily with an aseptic lotion, and some surgeons use iodoform as well. A small celluloid shade is then substituted for the bandage, and worn until the "stump" is fit to bear an artificial eye, which is usually in about six weeks' time.

Before leaving this subject, the nurse may be re-

minded that the patient's temperature must always be recorded both before and after enucleation; furthermore, that after removal, the eye must on no account be thrown away without the express sanction of the surgeon.

Although MULES' OPERATION is one in which the eyeball is opened, yet its after-treatment may be conveniently considered in this place. Aseptic precautions and dressings are here absolutely necessary. For the first two or three nights after operation, severe pain may call for a sleeping draught or the hypodermic injection of morphia. There is usually a certain amount of swelling of the conjunctiva, which may even protrude between the lids on to the cheek, but as a rule this chemosis speedily subsides; and the eyelids, also, nearly always become "puffy". The stitches (of which the nurse should notice the number inserted) are generally taken out at the end of the first week, but some operators, Mr. Mules among the number, did not hesitate to leave them in place altogether. The same gentleman informed me that he discarded dressings and bandages as soon as possible, as he believed that exposure to air had a salutary action on the parts.

B.—WHEN THE EYEBALL HAS BEEN OPENED, as in PARACENTESIS, CORNEAL SECTION, DISCISSION, IRIDECTOMY, SCLEROTOMY, and the various OPERATIONS FOR GLAUCOMA and CATARACT.

It will clear the ground if we consider DISCISSION or NEEDLING first. That operation is performed either to cure cataract or very high myopia in young per-

sons, or else to tear a hole in membrane left after extraction of senile cataract.

In the first cases, the pupil is dilated with atropine before operation, and, after the needling, an aseptic dressing is applied, and the patient put to bed. He is generally able to get up in twenty-four hours, and to leave off the dressings in three or four days. The use of the atropine is continued until all danger of inflammation is past. Glaucoma sometimes occurs as a complication of discission. In pre-aseptic days suppuration was by no means unknown.

With regard to needling as a sequel to the operation for senile cataract, the only after-treatment required is the application of a pad and bandage for a day or so.

PARACENTESIS and CORNEAL SECTION agree in this, that the wound is sometimes re-opened daily for a longer or shorter period by means of a delicate instrument. Aseptic dressings are used, and strict aseptic precautions are observed before, during, and after the operation.

In the after-treatment of the remaining operations (IRIDECTOMY, GLAUCOMA OPERATIONS, and CATARACT EXTRACTION), the following rules are observed, at least by most British surgeons.

1. Antiseptic or aseptic precautions are strictly enforced before, during, and after the operations.

2. Both eyes are bandaged for one or several days, even although one alone has been operated upon.

3. The patient is confined to bed, often in a slightly darkened room.

4. Physical exertion, vomiting, coughing, or sneezing are guarded against as much as possible.

5. "Slop diet" is given for twenty-four hours after operation.

An iridectomy or sclerotomy wound generally heals completely by the end of the first week or sooner, when the aseptic dressings are replaced either by a light protective bandage or by a shade to cover the eye that has been operated upon. Dressings are changed daily. Physostigmine (eserine) drops are put into the eye after iridectomy for glaucoma. The same drug is used by most surgeons both before and after the performance of sclerotomy; in the former case, to simplify the operation; in the latter case, to prevent prolapse or slipping forwards of the iris into the wound.

Extraction of Senile Cataract.—The after-treatment of this operation was in former days of a most elaborate character. Thus, both eyes were bandaged; the patient was put to bed in a chamber from which every ray of light had been most carefully excluded; examinations were conducted and dressings changed under the glimmer of a single candle; a special diet[1] was given; conversation was permitted

[1] Before the action of septic organisms was understood, it was generally believed that diet had a considerable influence in heightening or reducing inflammatory processes: a light diet was regarded as essentially anti-febrile. Accordingly, surgeons tried to prevent the onset of inflammation after cataract extraction by such a dietary as the following, which is copied from the Pharmacopœia of the Royal Westminster Ophthalmic Hospital.—Breakfast: tea, ½ pint; butter (after third day), ½ ounce. Tea: as for breakfast. During

in whispers only; the bowels were "locked" for some days by the use of opiates; and all possibility of accidental straining was most carefully guarded against. These precautions were rigorously observed for eight or ten days.

The tendency of late years, however, has been to do away with these complicated measures, an advance that dates from the recognition of the fact that suppuration after cataract extraction is due in every instance to septic infection of the wound. Modern methods aim at asepsis, and regard most other things as of minor importance. The surgeon, as we have seen, takes the greatest pains to prevent the entrance of organisms before, during, and after operation. Each time the eye is dressed, rigid aseptic precautions must be observed by those immediately concerned; fingers, instruments, and dressings must be surgically clean; and if it be necessary to use drops, they should be either freshly prepared, or, better, sterilised by boiling in a Stroschein's flask. In a word, until the wound is healed, and the anterior chamber re-formed, the eye should be treated as if it had been just operated upon.

As an example, let us take a case in which cataract

the remainder of the twenty-four hours: meat (finely powdered), 4 ounces; potatoes (five times a week), 4 ounces; custard pudding, 8 ounces; milk, 2 pints, or milk, 1 pint, with one pint of beef-tea, corn-flour or gruel; bread, 12 ounces.

The semi-fluid diet, now enjoined for twenty-four hours or so after operation, is given, of course, to avoid the bad results which might possibly arise were the patient allowed to masticate solid food.

has been removed from one eye alone. As soon as the operation is finished, the eye is usually washed with tepid saline (0·6 per cent.) or with boric lotion (saturated solution), both of which have been freed from germs by boiling. The eye is then shielded with a piece of sterilised gauze, whilst the ears, cheek, and nape of the neck are freed from blood and other liquid. The gauze is then removed, and to the eye that has been operated upon a sterilised or antiseptic dressing is applied, while to the other a plain sterilised dressing is used. Both eyes are covered with a roller or with a special form of bandage, such as the "Moorfields" pattern (see p. 126). In some hospitals, as already explained, bandages are dispensed with, and dressings kept in place with two cross strips of plaster.

The patient is carried to bed, and his eyes are screened from direct light. He is directed to lie upon his back or upon the side corresponding to the eye that has not been operated upon. He is told not to get out of bed for any purpose whatever, and is cautioned against interfering with his bandage in any way. He should be specially warned against trying to arrange the bedclothes for himself. Eyes have been damaged by neglect of this rule, the hands slipping up and striking the eye when the sheet or counterpane is pulled up. All straining must be most carefully avoided. The wrists may be lightly secured by a turn of bandage to the sides of the bedstead. Indeed, it is a good plan to adopt this precaution, at least during the night following operation, in every

case where a patient cannot be looked after by a separate nurse.

If thirsty, he may suck morsels of ice, but no food should be given during the first few hours after operation. As long as both eyes are bandaged, it goes almost without saying that a patient must not be allowed to feed himself or to put a foot out of bed without help.

For the first twenty-four hours, the diet should be restricted to bread and milk, tea, beef-tea, chicken broth, arrowroot, eggs, and light pudding; fish, or minced meat with potatoes, may be given on the second day; and, after that, ordinary food may, as a rule, be taken. Alcoholic stimulants are sometimes given to decrepit or broken-down patients under medical orders. In topers, too, alcohol should not be suddenly withheld, since by that plan we may do more harm than good. Delirium tremens, indeed, has been known to occur under these circumstances.

The smarting left by the operation generally subsides in three or four hours, and freedom from pain may be taken throughout as a sign that everything is going on well. Watering of the eye, often complained of by patients, has little significance if it occurs during the first few hours after operation, but later, say, on the fourth or fifth day, it is often an early sign of inflammation of the iris.

If the bowels have been well opened before the operation, there will probably be no action for two or three days after. In the contrary event, the bed-pan must be used, unless there are indications to the contrary, when the patient may be allowed, with the

nurse's help, to get out of bed, and to use a night commode. This is especially likely to be the case with very corpulent male patients.

The strain of vomiting is especially dangerous when the anterior chamber of the eye has been opened, as in cataract and iridectomy. It was more frequent in the days of chloroform and ether than it is now, when local anæsthesia by cocaine is the rule. But now and then the use of that alkaloid even is attended with troublesome retching and sickness. Under these circumstances, the best treatment is to keep the patient perfectly quiet, to give him small pieces of ice to suck, and to apply a mustard leaf to the pit of the stomach. Should vomiting occur, it is not advisable to remove the bandages, but the nurse should support them with the flat of her hand. If symptoms be not quickly relieved by these homely measures, it is best to acquaint the surgeon of the fact without loss of time.

Such symptoms as retention of urine or delirium must be at once reported to the surgeon. Retention of urine is not altogether uncommon, especially in nervous female patients of the upper classes. The constrained position in bed seems to be mainly responsible. The remedies are hot fomentations to the pubes, the sound of running water, the placing of the hands in cold water, or, in the last resort, the use of the catheter.

Confinement to bed, especially with both eyes bandaged, sometimes proves too much for elderly people, who become delirious or mentally deranged, particularly if they have been addicted to alcohol or drugs

or have any family or personal predisposition to mental instability. They often improve when allowed to get up and to replace the bandage by a shade. But it sometimes becomes necessary to let them go home before they are rid of the delusions.

Pain in the back, of which elderly people often complain, may be relieved by frequent slight changes of position in bed, much as pain in the eye may sometimes be relieved by raising the pillow. Old people often suffer from a troublesome cough, which must be subdued for the time being with opiates ordered under medical direction. Those with valvular disease of the heart or emphysema need especial care, as by a comfortable arrangement of the pillows and by changes in position. Corpulent or diabetic patients often bear confinement to bed badly. At other times old persons grow short of breath, and are distressed by cough and difficulty in breathing, symptoms due to a form of congestion of the lungs, spoken of as "hypostatic". For all such patients formal rules will have to be relaxed. They may be propped up in bed, and if that does not succeed, they must be allowed to get up, and to wear a shade instead of a bandage.[1]

It is customary to dress the eye twenty-four to seventy-two hours after operation. Most surgeons then content themselves with removing dressings, squeezing a little tepid sterile boric or saline lotion

[1] Professor Fuchs does not send very old patients or those who have difficulty in breathing, urinating, etc., to bed after operation. He simply allows them to sit in an easy chair. Even ordinary cases, without any such troubles, are allowed to sit up the second day. (*Ophthalmoscope*, August, 1912, p. 483.)

into the eye, but they do not inspect the cornea. Dressings are applied as in the first instance. This process is repeated daily. On each occasion the nurse should brush the patient's hair. On the second or third day, the surgeon generally opens the eyelids and looks at the cornea; when, all being well, the patient, with both eyes bandaged, is allowed to leave his bed for a few hours. Many surgeons use atropine drops (1 per cent.) daily, beginning on the second or third day. On the fourth, fifth, or sixth day the eye that has not been operated on is left unbandaged. At the end of ten days, more or less, according to circumstances, a large paper shade is substituted for the bandage; and a few days later, the patient is discharged, wearing a pair of dark protective goggles. On the average, cases that do well pass from under the immediate care of the surgeon in about a fortnight, reckoning from the day of operation.

Flies are sometimes very troublesome in hot weather to those whose eyes have been operated on. A simple way of meeting this difficulty is to throw a light piece of gauze over the patient's face.

The foregoing remarks apply to cases in which an iridectomy has formed part and parcel of the cataract extraction (the "combined operation"). When, however, iridectomy has not been done (the "simple operation"), the eye is inspected twenty-four hours later, so that any protrusion of the iris may be discovered and cut away at once.

Cataract extractions do not always progress so

smoothly as the above description might lead one to suppose, and the presence of one or more of the following signs will warn the nurse that all is not going on well.—(1) Slight rise of temperature. (2) The continuance or recurrence of pain, which, as stated previously, should subside soon after operation. (3) The presence of discharge in any quantity. If watery, it often points to iritis; if yellow and thick, to suppuration. (4) Swelling or redness of the free edge of the upper lid.

The chief complications may next be described separately.

An eyelash may become detached, and getting into the conjunctival sac may cause considerable irritation. It should obviously be removed at once, a duty that devolves, however, upon the surgeon rather than upon the nurse.

Owing to the irritation of the bandage, the orbicularis muscle may be thrown into action, and thus bring the lashes into contact with the eye. This condition, termed "Spasmodic Entropion," is most frequently met with in old persons. The first thing is to replace the bandage by a large shade covering both eyes. Should that fail to afford relief, the lower lid is drawn down, and its outer surface, together with the neighbouring skin, is dried and painted with contractile collodion, or, still better, with celloidin.[1] The traction thus exercised is sometimes sufficient to relieve the entropion. It is commonly

[1] Celloidin, ten parts; equal parts of absolute alcohol and ether, 100 parts.

imagined that greater strength is obtained by two coats or more of the varnish, but that is not the case: all that is required is to pass a large brush charged with the collodion once over the parts. In case these simple remedies fail (as they sometimes will), the surgeon resorts to operative measures, such as removing a piece of skin, or inserting stitches, so as to keep the lid in place.

Very soon after the completion of the operation, the patient may complain of great pain and the dressings may become soaked in blood. He may vomit. On inspection, blood may be found to be issuing from the incision, and, indeed, the vitreous humour may be expelled from the eye. What has happened in this case is that some of the blood-vessels of the interior of the eye have ruptured, and the name "*Expulsive Hæmorrhage*" is given to the condition. The eye is nearly always lost. Fortunately, this is a very rare complication. It may follow not only the extraction of cataract but an iridectomy for acute glaucoma as well or, indeed, any operation in which the eyeball is opened by the surgeon.

Inflammation of the iris is a frequent complication, and, like suppuration, when severe, is probably always an evidence of septic invasion. It manifests itself (usually on the fourth or fifth day after operation) by pain, swelling of the lid, watering of the eye, and intolerance to light. Leeches and atropine and hot compresses are the remedies commonly employed, and the room is generally darkened.

Suppuration, a rare but most serious complication,

seldom seen later than the second day after operation, may end in complete loss of sight. It is an old observation that badly nourished patients and those who suffer from diabetes are more liable to this complication than others. *Symptoms:* the eye becomes very painful and bloodshot, the lids swollen and bathed in yellow discharge, while the wound looks grey and sloughy, fails to unite, and has a generally unhealthy appearance. This formidable complication calls for prompt action if sight is to be preserved. —The surgeon separates the lids, washes all discharge away with antiseptic lotion, as hydrogen peroxide, and dusts the wound with iodoform. Hot fomentations are then applied, and the patient put upon a liberal allowance of meat and stimulants. An excellent treatment, much in vogue nowadays, is to apply the actual or galvanocautery to the wound. Subconjunctival injections of sublimate or of oxycyanide of mercury are recommended by some good authorities. Vaccines are sometimes injected with more or less success.

Any account would be incomplete which omitted to mention the views of those surgeons who dispense altogether with bandages in the after-treatment of cataract. Although that method has been extensively used in America, apparently with good results, yet it has not so far commended itself to the generality of British ophthalmic surgeons. The American practice is to cover the lids of one or both eyes immediately after operation with a strip of thin isinglass plaster, measuring 1 by 1½ inches, and

reaching from brow to cheek. The plaster is applied smoothly to the lids in such a way that the inner and outer angles of the eyes are left open, both for the escape of secretion and for the application of remedies. By these means the lid is kept in contact with the globe, thus forming a protective covering, which may be regarded as a kind of natural splint. After operation the patient is allowed to walk to his bed, where he is kept until the following day. The room in which he lies is not darkened, and moderate exercise is permitted.

Protective shields of wire or other material are sometimes used (see Chapter IX.).

CHAPTER XI.

A BRIEF ACCOUNT OF THE COMMONER DISEASES OF THE EYE, WITH HINTS AS TO THEIR NURSING.

MANY passing hints have been given in different parts of this book as to the nursing of particular diseases, but it will be advisable, nevertheless, to gather those hints together in the following chapter. I must disclaim, however, any intention of describing a tithe of the diseases to which the eye is liable; my idea is simply to deal briefly with those everyday affections which the nurse will often be called upon to treat under medical directions.

STYE OR HORDEOLUM.

A stye is a small abscess at the root of an eyelash. It is a common affection, especially in children.

The usual treatment, after a purge, is to apply hot fomentations or warm compresses, whereby the "boil" is brought to a head, when it either breaks of its own accord, or is laid open by the knife of the surgeon. A commencing stye may sometimes be cut short by pulling out the lash, around the root of which it has formed.

BLEPHARITIS, TINEA TARSI, OR OPHTHALMIA TARSI.

Blepharitis is an affection of the lashes, at the roots of which scales or scabs form, while the under-

lying skin is often ulcerated. The free edge of the lids becomes thickened, and the lashes fall out; in neglected cases, indeed, the margin of the lid may become quite bald (*madarosis*), the patient presenting under those circumstances a blear-eyed and unsightly appearance which has received the name of "Lippitudo". The fact should be added that the upper lid is more subject to blepharitis than the lower one.

It is difficult to cure a severe case of tinea tarsi. The scales, it is true, may be removed easily enough for the time being, but, generally speaking, they form again sooner or later. In point of fact, treatment in many instances is merely palliative.

The favourite remedies for blepharitis are mercurial ointments, such as that of the nitrate, of the red or of the yellow oxide, or of ammoniated mercury. Tar ointment is sometimes used. Whatever be the ointment selected, it is well rubbed into the edge of the lids night and morning, either with the pulp of the forefinger or by means of a piece of gauze. In specially severe cases the medicament, smeared on a piece of linen, is left in contact with the lids all night. Whenever the crusts are thick it is a good plan to begin by cutting the lashes short. Before applying ointments, all scales or scabs must be removed, so as to expose the reddened skin beneath, and this may be effected in various ways. The simplest plan is by fomenting the lids with really hot water for ten minutes or longer, when the softened scabs are rubbed off with a piece of gauze or detached by forceps. A lotion containing ten

grains of borax or of carbonate of soda to the ounce, used hot, often acts better than plain water, because the alkali penetrates the greasy scales, and so loosens them from their attachment. In the most severe cases of tinea tarsi it is best to pluck out the whole of the lashes, a small operation fully described in a later chapter. After the lashes have been epilated, it was once a common practice to rub the edges of the lids with diluted silver stick, or to paint them with a solution of that caustic (twenty grains to the ounce). This application was repeated twice a week until the disease was cured. Liquefied carbolic acid or iodophenochloral (a mixture of iodine, carbolic acid, and chloral) is sometimes applied in this way. Another efficacious and less barbarous method of treating cases of severe blepharitis is to rub the diseased lashes two or three times a week with a 20 per cent. solution of protargol until a lather is produced. This is spoken of as *protargolage* (Darier). It often succeeds admirably.

Phlyctenular Conjunctivitis.

In the common form of this affection, one or more reddish-yellow pimples make their appearance on the white of the eye, as a rule close to the cornea, while each becomes the centre of a small inflammatory patch. After increasing in size, the "phlyctenulæ," as they are called, rupture, leaving small ulcers which readily skin over, and a cure is soon completed. The cornea, also, is often affected in a similar way, when

the disease is spoken of as "phlyctenular keratitis". Photophobia is then common and apt to be obstinate.

In a child with phlyctenular disease, the orbicularis muscle is often tightly contracted, and it then becomes a matter of some difficulty either to examine the eye or to apply remedies. The nurse will find in a later section full directions as to the management of such cases. A complication of phlyctenular conjunctivitis may be mentioned here, namely, an excoriation of the delicate skin at the outer canthus, the result of soddening by tears and secretion. Although in many instances this heals of its own accord when the eye gets better, yet it may call for special treatment. In that event, zinc oxide or boric ointment may be applied the last thing at night, or the affected skin may be lightly touched with mitigated nitrate of silver stick.

Phlyctenular conjunctivitis is essentially an ailment of childhood, especially from the second to the eighth year of life, and for the most part attacks "scrofulous" children belonging to the poorer classes. As might be expected, the disease is commonly associated with other marks of "struma," such as enlarged glands, eruptions on the face, head, nostrils, or ears, thickened lips, or discharge from the external auditory meatus. Tubercle is not uncommon. It is very apt to recur again and again in the same individual. It is by far the commonest eye disease in poor children, and, if neglected, often damages sight, although it seldom leads to actual blindness.

As to treatment, the usual plan is to put a morsel of the yellow oxide of mercury ointment into the

conjunctival sac, and then to rub it well into the eye, as explained in Chapter V.; or the ammoniated mercury ointment is sometimes used instead of the yellow oxide. Some dusting powders, too (especially calomel), enjoy much reputation in the treatment of the disease. Tonics, sponge-baths, cod-liver oil, and systematic exercise in the open air are often needed to clinch the cure. In out-patient practice it is an excellent plan to get the patient to attend hospital daily, so that there may be some guarantee that remedies are used in an efficient way.

Two cautions should be given, *viz.*, not to bandage the eyes of a child suffering from phlyctenular disease, and never to allow him to mope away in dark corners.

General management is all-important. The following printed instructions are issued to the parents of such patients by the Queen's Hospital for Children, London:—

THE QUEEN'S HOSPITAL FOR CHILDREN,

HACKNEY ROAD, BETHNAL GREEN, LONDON, E.

Directions to Mothers for bringing up their Children between the ages of three and seven years.

Food.—Meals must be given at regular times, and the child should have nothing between meals except a drink of milk or of milk and water.

The meals should be: Breakfast, Dinner, Tea and Supper. Good times are: Breakfast at 8 o'clock; Dinner at 12.30 o'clock; Tea at 4.30 o'clock; and Supper at 6.30 o'clock.

Breakfast and Supper should consist of milk or of cocoa made with water and an equal quantity of milk added and sweetened,

and bread with plenty of butter, dripping or margarine. Oatmeal or wheatmeal porridge should be given two or three mornings a week, or oftener in cold weather. A breakfast or supper of bread and milk may be given two or three times a week. Eggs—poached or lightly boiled—are good for children. Bacon, and especially bacon-fat, may be given now and then to children over three years of age.

A *Lunch* of milk with a biscuit or a crust of bread; a piece of plain bread cake should be given if possible.

Dinner.—A meat dinner, namely, of fresh meat—hashed or stewed—or of meat broth should be given two or three times a week to growing children. All meat should be minced or cut up finely for children under four or five years of age. Milk puddings, such as rice, sago, semolina, cornflour, or macaroni should be given as often as possible. Fruit, stewed, or made into a pudding, may be given when in season. Egg puddings are also good. In the winter a good dinner is pea or lentil soup, with potatoes and bread, and in summer haricot or barley soup, followed by a milk pudding. A dinner of wet fish (boiled or steamed) may be given once or twice a week. Boiled rice, potatoes, gravy, cauliflower, and spinach, are all good for children. Baked apples and oranges with the pips removed are good.

Tea.—This should be of milk with a slice of bread and butter, with or without marmalade, jam, honey, or treacle. For children under six years of age, milk should be given instead of tea. At least a pint of milk should be given in the course of the day.

You must *not* give your child any of the following things: Tea, coffee, beer, spirits, pickles, fried or salt fish, cheese, dried or salt meat, sausages, new bread, pastry, unripe or unsound fruit, nuts, dried currants, whole raisins, plums, cherries or sweetmeats. Ham, pork and liver are all unwholesome for young children.

Air.—Your child will not be strong and well unless it has plenty of fresh air, indoors as well as out-of-doors. Keep the windows both of the living and of the bed-room open day and night. The child will take no harm at night if the bed-clothing be enough. Let the child be out of doors as much as possible.

Cleanliness.—Children under three years of age need a warm bath every night, and over that age two or three nights a week.

It is a good plan to sponge the child over every morning with

cold or tepid water, drying it quickly with a rough towel afterwards. Delicate children may stand in warm water whilst the cold water is being applied to the rest of the body.

Clothing.—Wool or flannel (not flannelette) should be worn next to the skin all the year round. The body, arms, and thighs should be covered. Stockings should come high up and sleeves low down. Clothing must be warm, comfortable, and not too tight. Care must be taken to see that the boots are water-tight.

Sleep.—Send the child to bed early, and let it have twelve hours' sleep.

Drawn up by the Medical Committee and issued by order of the House Committee.

March, 1905.

Trachoma or Granular Lids.

In the United Kingdom trachoma is still met with in some parochial schools and among the poor generally, although cases are very rare among the wealthier classes of society. From some countries, as Egypt, Algeria, and Ireland, the disease is never absent. Trachoma, as stated previously, is a contagious disorder. It is the cause of a great amount of blindness. For instance, out of 1,000 eyes examined by Cohn, seventeen had been blinded by trachoma.

The symptoms of trachoma, briefly stated, are as follows: discharge is present; the conjunctiva of the lids becomes red, thickened, and studded with granulations, sometimes resembling those of "proud flesh," at other times reminding one of grains of boiled sago. As a complication, the cornea may be ulcerated, or it may become red from the development of blood-vessels under its epithelium, a condition known as "pannus".

Mild remedies merely aggravate the disease: to be successful, treatment must be energetic. Thus, the lids are everted, and the diseased conjunctiva is directly treated with blue-stone, lapis divinus, mitigated nitrate of silver, or diluted corrosive sublimate. Solutions of lunar caustic (grs. 10-20 to an ounce of distilled water) are also commonly used. This treatment is persevered with daily until the discharge has subsided, and the lids have regained their natural smoothness, often a matter of many months. Besides these strong measures, the eyes are washed out three or four times a day with one or other of the aseptic or antiseptic lotions mentioned in the chapter on Remedies. Finally, it is often necessary to resort to operative measures, such as excising the cul-de-sac, or squeezing out the granulations ("expression").

The strong remedies enumerated above should not be applied to the lids at bedtime, inasmuch as they excite a secretion which is apt to do mischief during the night.

In trachoma, it is not advisable to use bandages or other dressing which would have the effect of keeping discharges pent up within the lids.

The Various Forms of Ophthalmia.

"Ophthalmia" is a general name signifying inflammation of the conjunctiva; it includes the following varieties:—

1. Muco-purulent or catarrhal ophthalmia.
2. Diplobacillary or angular ophthalmia.

3. Ophthalmia neonatorum.
4. Gonorrhœal ophthalmia.

Ophthalmia, as stated before, is contagious—that is, it may be passed on from the sick to the healthy. Of the three varieties, the gonorrhœal is the most virulent in this respect, while the muco-purulent, on the other hand, is less contagious. In dealing with all forms of ophthalmia, however, a nurse should carefully follow the advice given in Chapter III.

Before describing the diseases separately, it may be well to lay down the following rules, which apply to all cases.

1. The patient should be kept apart from other persons.

2. When one eye alone is affected, the other must be covered with a protective appliance.

3. Discharge should on no account be allowed to collect in an eye, and must be washed away as soon as it forms.

4. In applying lotions, the lids should usually be everted, and syringes should seldom, if ever, be used.

5. Bandages ought never to be applied, except under medical directions.

6. Lids glued together by secretion should be bathed before any attempt is made to separate them.

7. A morsel of vaseline, cold cream, unguentum zinci oleatis, unguentum acidi borici, or unguentum iodoformi, should be put into the eye at night, so as to prevent that sticking together of the lids which is alike painful to the patient and a hindrance to recovery.

8. After recovery, the room occupied by the patient should be disinfected.

1. *Muco-purulent Ophthalmia* ("*Blight*").—The patient, if an adult, complains of a sensation which he says is "like sand in the eye". The lids may be somewhat red and swollen, and the eye looks blood-shot. The ocular conjunctiva often shows small plum-coloured spots or patches, due to rupture of the blood-vessels; and it is occasionally puffed up, so as to resemble a bladder, a condition known as "chemosis". A slightly yellowish discharge flows from the eye, but it is important to note that the secretion is not actual pus. All the foregoing signs become more marked at night.

In the majority of instances, catarrhal ophthalmia, although an acute, is not a serious affection, and gets well in the course of two or three weeks without entailing any evil consequences. The disease, it should be mentioned, is liable to relapse after apparent cure.

With regard to treatment, various plans are in vogue. For instance, some surgeons trust wholly to frequent washings with weak corrosive sublimate or other antiseptic lotion, while others add to that the constant use of cold applications. The practice of a third school, besides employing weak antiseptic lotions, is to paint the conjunctiva of the everted lids daily with solution of lunar caustic (10 grs. to the ounce), or of largin, 10 per cent. Argyrol, 15 per cent., is, however, the most popular remedy nowadays, dropped into the affected eye three times a day or oftener. That combined with local cleanliness will speedily cure most cases.

2. *Diplobacillary or Angular Ophthalmia.*—This common affection takes the form of a subacute or chronic inflammation of the conjunctiva, characterised by scanty discharge, slight redness of the palpebral conjunctiva, and, most important of all, redness and excoriation of the skin at the corners of the eye. The patient complains that his eyes feel sore, and that they "stick" in the mornings. The Morax-Axenfeld diplobacillus is the cause of the affection, and the cure the dropping into the eye of a solution of zinc chloride or sulphate.

3. *Ophthalmia Neonatorum.*—This disease is due in every instance to inoculation of the eyes with infective vaginal secretion before, during, or after the passage of the child into the world. Directly or indirectly, then, every case is the result of contamination with unwholesome maternal secretions. The disease is almost always preventable, provided proper attention be given to the baby's eyes at birth and after. Ophthalmia neonatorum usually appears on the third day after birth, and if neglected, may speedily lead to loss of sight. Of the inmates of blind asylums, it is probable that at least one-third owe their unfortunate condition to this disease (Fuchs). In short, we shall not err in regarding ophthalmia neonatorum as by far the most frequent cause of preventable blindness. Fortunately, however, a means of prevention, as simple in its application as it is satisfactory in its results, lies close at hand, namely, Credé's method. As soon as the child is born, its lids are gently drawn apart, and a single drop of a 2 per cent. solution of silver nitrate

is allowed to fall upon each cornea from a glass rod. By the adoption of these means, Credé reduced the frequency of ophthalmia from more than 10 per cent. to less than 1 per cent. among the children born in the Leipzig Maternity Hospital. Under medical direction, Credé's method [1] may be employed, but, in ordinary circumstances, a nurse will naturally confine herself to those measures embodied in the following memorandum issued under the authority of the Central Midwives Board.

INFLAMMATION OF THE EYES IN NEW-BORN CHILDREN.

Ophthalmia Neonatorum.

This is a very common cause of *hopeless blindness*, which is one of the greatest misfortunes that can happen to a child. A very large number of children will be saved from blindness if the following directions of the Central Midwives Board are observed.

The disease generally arises from purulent discharges from the mother getting into the baby's eyes at birth.

It is therefore of the greatest importance that this should be prevented :—

1. By curing such discharges if possible before labour. This requires medical treatment (Rule E. 19 (2) & (3)).
2. By taking the greatest care that such discharges shall not be carried into the baby's eyes when it opens them for the first time soon after its head is born.

The discharges may be carried to the baby's eyes in the following ways :—

(*a*) The discharges collect round its eyes, especially the eyelashes, and easily get into its eyes.

This can be generally prevented if the midwife observes Rule E. 14 : "As soon as the child's head is born, and if possible before the eyes are opened, its eyelids must be carefully

[1] A 1 per cent. solution of silver nitrate is nowadays usually substituted for the 2 per cent. solution advised by Credé. Experience shows that it is less irritating and just as efficient.

cleansed". They should be thoroughly wiped with clean material such as cotton-wool, lint, or rag, using separate pieces for each eye. The reason for this is that the piece used for wiping the first eye will be polluted by the discharges, and should not be used for the other eye.

(*b*) New-born babies sometimes rub their eyes with their hands. This may rub the discharges into their eyes. When Rule E. 14 has been complied with the baby's hands must be carefully cleansed.

(*c*) When the baby is bathed the discharges with which its body is covered during labour are washed off into the bath-water. If its face is washed in this water, matter may get into the eyes.

N.B.—The above directions are to be observed in all *cases, whether purulent discharges are known to be present or not.*

The Central Midwives Board is determined, so far as lies in its power, to secure the strict observance of its Rules and Directions, and to punish any failure to comply with them, even in cases where no harm can be proved to have followed from their neglect.

F. H. CHAMPNEYS, M.D., F.R.C.P.,
Chairman of the Central Midwives Board.

December, 1909.

This leaflet was drawn up and issued at the request of the Board.

The symptoms of this disease resemble those of acute catarrhal ophthalmia, although they are usually more severe. The lids, for example, are red, hot, and much swollen, and a great quantity of yellow matter, often bloodstained in the earlier stages, is discharged from the eye. As a recent writer has graphically put it: "Soon, instead of eyes, there seem to be two enormous abscesses in the sockets, from which a continuous stream of pus issues" (H. C. Mactier). The disease almost invariably attacks both eyes, one soon after the other. If proper steps be not taken,

the cornea is apt to ulcerate, and the eye may be much damaged, or even wholly lost.

It is important to bear in mind that *while practically every case of ophthalmia neonatorum is due to inoculation, direct or indirect, yet a proportion only of the cases are owing to the gonococcus.* In about one-third of the cases, the determining micro-organism is not the gonococcus, but some other microbe that is contained in the maternal secretions. Hence every case of ophthalmia neonatorum is not of venereal origin, and does not imply a lapse from virtue on the part of one or other parent.

Ophthalmia neonatorum is generally treated by painting the everted conjunctiva with a 10-grain solution of lunar caustic or a 50 per cent. solution of protargol, and repeating the process once or twice a day, according to the severity of the disease. Between these applications, purulent discharge is washed away from the eye by means of weak aseptic or antiseptic lotions, as hydrogen peroxide, normal saline, chlorine water, boric acid, potassium permanganate, or alum. It is often necessary to apply the lotion every half-hour, and success depends to a great extent upon the care with which that operation is conducted. This must be carried out with the utmost gentleness, since otherwise there is a risk of abrading the delicate covering of the cornea, the so-called epithelium. Other remedies much used in ophthalmia neonatorum are argyrol (25 per cent.) or sophol (25 per cent.), which are usually dropped into the eye and not painted over the everted eyelids.

It is almost impossible to apply remedies to a baby's eye satisfactorily unless he be held by the nurse in the way mentioned in Chapter XIII. The infant's head having been fixed between the nurse's knees, she turns out the lids, and removes all discharge by small sterile pieces of wool steeped in saline or boric lotion. The exposed conjunctiva is then dried by means of absorbent wool or gauze, and, lastly, the everted lids are treated with silver as described in Chapter V. The surgeon often finds it necessary to use a retractor to raise the upper lid in order that he may examine the cornea, but a nurse should not employ that instrument, except under medical directions. Should the lids become everted, as they sometimes do, they must be replaced, but a bandage should not be used.

4. *Gonorrhœal Ophthalmia.*—This is the most serious as well as the most contagious form of ophthalmia, and even under prompt and experienced treatment eyes are not infrequently lost from ulceration or sloughing of the cornea. Inasmuch as the disease generally attacks one eye in the first instance, it becomes of great importance to protect the second eye against inoculation. Wherefore, a Buller's shield (page 34), or other equivalent appliance, should be always used.

The symptoms are like those already described in ophthalmia neonatorum, but they are usually much more pronounced. The reddened and livid lids may be swollen to the size of a Tangerine orange, and a profuse discharge of pus takes place from

the œdematous palpebral conjunctiva. Chemosis is a marked symptom, and may be so severe that the cornea seems to lie at the bottom of a pit, the walls of which are formed by a ring of swollen conjunctiva. Paroxysms of pain often prevent sleep either by day or by night.

The treatment of gonorrhœal ophthalmia proceeds on the same lines as those described above for ophthalmia neonatorum. Many surgeons, however, use iced applications to the lids. The combined retractor and douche, mentioned in Chapter V., often renders signal service in this affection by allowing us to reach the conjunctival cul-de-sac with lotion. The greatest gentleness should be exercised in applying lotion to these inflamed eyes.

Vaginal or vulvar discharges should be looked for in women or female children, and, if found, the fact should be reported to the surgeon.

In dealing with so contagious a disease as gonorrhœal ophthalmia, a nurse must take every precaution against infecting her own eyes. To that end, she should most rigorously observe the rules laid down on page 40.

There is some evidence to show that flies may carry contagious particles from eye to eye. It is well, therefore, when dealing with purulent ophthalmia, to provide plenty of fly-papers, so as to reduce such a possibility to its lowest limits.

Before leaving the subject of contagious ophthalmia, a list may be given of articles that should be ready at hand against the surgeon's visit: jaconet

apron, mackintosh sheet, cotton-wool, absorbent gauze, a pair of retractors, normal saline solution, hydrogen peroxide, boric lotion, solution of silver nitrate (10 grains to the ounce), protargol 50 per cent., argyrol 25 per cent., and a camel-hair brush, mitigated silver stick in holder, atropine drops (4 grains to the ounce), iodoform, eserine drops (2 grs. to the ounce).

Ulceration of the Cornea.

A nurse will have learnt elsewhere that by ulceration is meant the local death and casting away of a portion of the body. Thus, an ulcer of the leg and an ulcer of the cornea are examples of essentially similar processes, due allowance being made for difference in position, in size, and in structures involved.

Among the causes of ulceration of the cornea may be mentioned infection, eczema, injuries, "scrofula," debility, and the different forms of ophthalmia.

How can we tell when an ulcer is present? The most obvious sign is the ulcer, which manifests itself as a small pit or depression in the cornea, staining a vivid green when fluorescein is dropped into the eye. The patient complains of pain and dreads light, which he does all he can to avoid. Indeed, so characteristic is this photophobia that whenever it is observed an ulcer of the cornea should be suspected. Redness of the eye is generally present, although it varies much in intensity.

Ulcers vary much in size, position, and severity.

They may, for instance, be superficial or deep, or they may have a tendency to spread widely, when they are spoken of as "serpiginous". A superficial ulcer may heal without leaving any perceptible blemish, but a deep ulcer, on the other hand, always leaves a resulting mark. To such scars, various names are given depending upon their density. Thus, a mark so faint as to need artificial light for its discovery is called a *macula;* when more pronounced, and visible under conditions of ordinary illumination, a *nebula;* and when it takes the form of a staring white patch, a *leucoma*. Macula, nebula, and leucoma may exist together in the same eye. It is obvious that such opacities lying in the line of sight will seriously interfere with vision.

The treatment of corneal ulceration may be summed up in a few words.—In acute ulcers, the eye is protected from glare by means of a large double shade extending on to the temples, so as to cut off side light, while pain is relieved by hot compresses, and by the local use of atropine or dionine, either together or separately. The most serious cases call for operative measures, such as burning or scraping. Chronic ulcers are stimulated to heal by the application of mercurial ointments, and in other ways.

In dealing with ulcers generally, it is of the first importance to improve the general health, and to shield the eye from all irritation.

Iritis (Irido-Cyclitis).

Irido-cyclitis, or inflammation of the iris and ciliary

body, is due to a number of causes, of which the more important are syphilis, gonorrhœa, injury, infection, and (perhaps) rheumatism. The eye is reddened, dreads light, waters freely, and there may be much pain, which is generally most marked towards two or three o'clock A.M. The colour of the inflamed iris changes, and its beautiful structure gets blurred. The pupil becomes small, and reacts poorly, or not at all, to light. Adhesions, called posterior synechiæ, form between the iris, on the one hand, and the capsule of the crystalline lens, on the other. There may be an exudation of so-called "pus" into the anterior chamber, forming what is known as hypopyon.

The usual treatment is by atropine and hot fomentations. Dionine is often employed to relieve pain. Leeches may be necessary. General remedies, as mercury, are as a rule administered. The inflamed eye is shielded from light either by a pad and bandage, or by confining the patient to a partially darkened room. Severe cases are best kept in bed during the acute stages of the disease. Absolute rest for the inflamed eye is essential. Attention to the state of the bowels is of special importance in cases of acute irido-cyclitis.

CHAPTER XII.

SHADES.—ARTIFICIAL EYES.—SPECTACLES.

Shades.

In many diseased conditions it is desirable to lessen the amount of light entering the eye, more especially when the cornea is involved. This end is usually attained by means of shades, various forms of which are in everyday use. They range from the simple contrivances of ingenious nurses, on the one hand, to the elaborate apparatus of the instrument maker, on the other; and they may be constructed of cardboard, paper, plaited straw, perforated zinc, silk, gauze, celluloid, or other material.

Shades, as a rule, are black or dark green in colour; perhaps the commonest is one made of brown paper, covered on both sides with black silk. In those instances, however, where it is meant to hide from view an unsightly orbit, a small closely-fitting celluloid shade is worn, the colour of which is pink, the better to conceal the deformity. This is one of the very few cases in which a single shade (that is, covering one eye only) may be allowed. A double shade, covering both sides, is almost invariably used, even when the trouble is confined to one eye.

It is almost unnecessary to point out that soiled

shades, like soiled bandages, might very possibly be a means of conveying contagious particles from eye to eye, if used for more than one person. But this is not all; for it has been shown beyond all peradventure that after an eye has recovered from a contagious disorder, it may become once more infected by a germ-laden shade. It is in view of these facts that shades made of paper are recommended above all others. Such shades, which cost little in the first instance, can be burnt as soon as they become in the least degree soiled. On the other hand, shades bought from the chemist are naturally looked upon as too good to destroy, and are accordingly often kept in a family for years together, thus forming a dangerous kind of heirloom.

Three rules, then, should be borne in mind with regard to this subject: first, shades should be made of paper in preference to any other material; secondly, they should be burned as soon as soiled: thirdly, they should under no circumstance be used for more than one person.

Various kinds of paper may be used for shades. That variety known to stationers as "olive green board" forms an excellent material for the purpose. It is sold in large sheets of two different sizes—"Royal," measuring 28½ by 21 inches, and "Imperial," measuring 22½ by 18 inches. Stout packing paper, either brown or drab, does equally well.

Shades may be either "single" or "double"; the former being meant to shield one eye, and the latter both.

The simplest method of making a double shade is to cut with sharp scissors a semicircular piece of paper, large enough to cover in the temples and to cut off all side light. The shape of the shade is exactly that of the peak of an ordinary cloth cap, only that it is larger. Another pattern, which is shaped to fit the bridge of the nose, is shown by

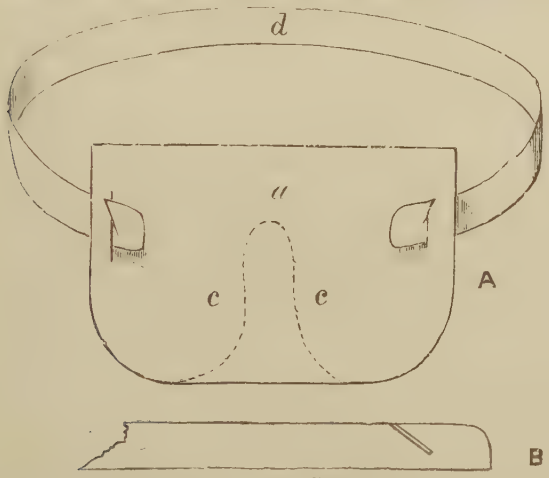

Fig. 37. Paper Shade.

A Completed shade, which consists of *a* the shield, and *d* the band.
The dotted line *c* is an alternative shape.
B Band enlarged, showing oblique slit.

the dotted line in Fig. 37. The straight upper border is edged with three-quarter inch tape, the ends of which are left long, so that they may be tied behind the patient's head. In shop-made shades, elastic is often used, but it tends to give rise to pain in the scalp and headache, and the nurse will find tape or ribbon better in every way.

Another excellent way of making a shade, although a trifle more complicated than that described above, is as follows.—A piece of slate-coloured packing paper is cut out into a shape resembling that of a peaked cap, only much broader and deeper, say, six inches deep by ten inches broad (Fig. 37, *A*). This makes the shield, which is completed by adding two downward slits, two inches in length, near each of its top corners. The next part of the shade is the band, which is also made of paper, about an inch and a half broad, and long enough to go round the patient's head (Fig. 37, *d*). Near one end of the band a slanting cut is made about half way through its breadth, and the notch thus made catches in the slit of the shield, and the two become firmly interlocked. The other end of the band is still free. It is passed round the patient's head and drawn through the remaining slit on the opposite side of the shield. Another notch is cut in the band, and it may then be locked in position at both ends. The shade thus described consists, then, of two essential parts, a shield and a band, both made of coarse brown paper. A reference to the figure will make these points clear. Simple modifications of this shade will, of course, occur to the mind of every nurse.

Artificial Eyes.

An artificial eye—that is to say, a glass shell closely resembling in shape and colour the front part of the eye—is generally worn after removal of an eyeball (enucleation) or of its contents (evisceration).

Further, it is sometimes placed directly over a shrunken globe. Glass is occasionally replaced by celluloid, a material which has the advantage of being practically unbreakable. That material, however, is said to undergo a chemical decomposition in consequence of which it is liable to give rise to severe irritation of the orbital tissues.

For some time after either of the operations mentioned the stump of conjunctiva and other tissues left behind in the orbit remains irritable and red, and throws off more or less discharge. These symptoms must be allowed to subside before the patient will be able to use an artificial eye. At first a glass eye is worn for an hour or two only each day, but the time can be lengthened by degrees as the socket becomes tolerant, until finally it is worn all day long. Under no circumstances, however, should an artificial eye be retained at night. When the patient goes to bed, he should take out the eye, wash and dry it, and put it away in a safe place until next morning. He should never leave it over-night, as some people do, in a tumbler of water.

Artificial eyes wear out sooner or later, and under conditions of ordinary wear and tear can hardly be expected to last for more than a year or eighteen months. The surface becomes rough, and is then likely to worry and inflame the conjunctiva.

Every nurse should understand the proper way both of putting in and of taking out an artificial eye. The following rules were printed by the authorities of the Moorfields Eye Hospital for the guidance of patients :—

Instructions for Persons Wearing an Artificial Eye.

To take the eye out.—The lower lid must be drawn downwards with the middle finger of the left hand; and then, with the right hand, the end of a small bodkin must be put beneath the lower edge of the artificial eye, which must be raised gently forwards over the lower eyelid, when it will readily drop out. At this time care must be taken that the eye does not fall on the ground, or other hard place, as it is very brittle, and may easily be broken by a fall.

To put the eye in.—Place the left hand flat upon the forehead, and with the two middle fingers raise the upper eyelid towards the eyebrow; then, with the right hand, push the upper edge of the artificial eye beneath the upper lid, which may now be allowed to drop upon the eye. The eye must then be supported with the middle fingers of the left hand, whilst the lower eyelid is raised over its lower edge with the right hand.

The presence of even a smooth and well-fitting artificial eye sometimes gives rise to a discharge from the conjunctiva. In such cases it is a good plan to insert a piece of wool, moistened in boric acid lotion, beneath the lids at night; and, if that does not check the discharge, a thin layer of wool, wet with some astringent lotion, may be worn behind the shell during the day-time.

In conclusion, let me add that it is an excellent routine practice to put a morsel of vaseline into the orbit once or twice a day. By this means not only are the movements of the artificial eye made easier, but wear and tear to some extent at least is reduced. Furthermore, the little precaution adds considerably to the comfort of the patient.

Spectacles.

The most common use of spectacles is to assist sight, for which purpose various kinds of spherical

and cylindrical glasses are used. At other times spectacles are employed to moderate light, or to protect the wearer against wind, dust, contagious particles, or the glare of sun or snow. Occasionally they are worn for the sake of appearance, as when a magnifying glass is placed before a shrunken eye in order to make it appear larger than it really is.

A careful man places his silk hat upon the table in such a way that it rests upon its brim and the edge of its crown. He knows from experience that if the hat be placed flat upon its crown it is likely to get soiled, and otherwise damaged. In the same kind of way spectacles should be put aside so that they rest on the edge of the glasses and upon the wire side fasteners, or "temples" as they are called by the opticians. If this be not done the glass face soon becomes scratched and spoilt.

As in the case of eye-shades, glasses may convey contagious particles from eye to eye. They should, therefore, under some circumstances, be disinfected with one to twenty carbolic solution at night. At the same time it is well to smear the steel frames with vaseline in order to prevent rust.

Fig. 38. Spectacle Fastening.

When dealing with children, the nurse should never allow wadding to be placed under the bridge of the spectacles, nor should they be tied

behind the head in the ordinary way. To keep them in place the ingenious plan (which we owe to Mr. N. B. Harman) shown in Fig. 38 may be adopted.

Should the skin of the nose or that behind the ears become chafed, it is a sign that the frame does not fit properly, and its shape should be set right as soon as possible. In the meantime, tender skin may be hardened with alcohol or with strong salt and water, while zinc or boric ointment may be applied to any sore places. It is often advisable to leave off the spectacles for a few days.

If the glasses be very greasy and dirty, nothing answers better than ammonia and water for cleansing purposes.

CHAPTER XIII.

EPILATION OF EYELASHES.—REMOVAL OF FOREIGN BODIES FROM THE EYE.—EXAMINATION OF TROUBLESOME CHILDREN.

Epilation of Eyelashes.

Lashes are pulled out for various reasons: for instance, they may turn inwards, and rub against the eyeball, a condition known as *trichiasis*. The removal of a lash may sometimes cut short a commencing stye, while a similar operation often does much good in cases of severe blepharitis. A nurse may be directed to epilate lashes, and in that event

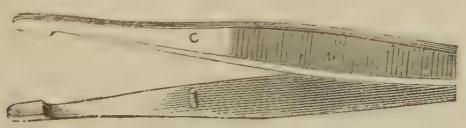

Fig. 39. Epilation Forceps.

attention should be paid to the following points: (1) Instruments: a pair of ordinary dressing or dissecting forceps, the teeth of which meet accurately together, might be used. The small instrument, known as "epilation forceps" (Fig. 39), which has broad rounded ends and no teeth, is, however, much better for the purpose. (2) Position: the patient

should be seated, while the nurse stands behind his head. (3) Operation: should it be necessary to pluck out all the lashes, the nurse stretches the lid lightly between her fingers, and rapidly drags out bundles of lashes, and finishes by picking off those that have escaped the grasp of the forceps in the first instance. In epilating a few lashes, each one should be seized as close to its root as possible. The operator then pulls the lash steadily forwards, until, torn from its follicle, it comes away in the grip of the forceps.

Removal of Foreign Bodies from the Eye.

Most people know from painful experience what it is to have a foreign body in the eye. A lash may get between the lids, or the sufferer may feel the sudden impact of a foreign object, such as an insect, a bit of metal, or a piece of straw. The eye waters; it soon becomes bloodshot; and cannot bear the light. The slightest movement of the globe causes intense pain, and accordingly the patient keeps his eye shut.

The crudest methods are often practised in order to get rid of the cause of the mischief. For instance, the nose is violently blown; or a pinch of snuff is given to the patient, in the hope that the resulting flow of tears may dislodge and wash the offending particle away. Even small flat stones are put into the eye, and rubbed about, in order to get rid of the intruder. It need hardly be pointed out to the intelligent reader that such methods as these are not

only useless but in most cases actually dangerous, and, further, that the obvious remedy of directly removing the foreign body is the only one worthy of a moment's attention.

The patient should be placed facing a good light, and a careful search made for the foreign body. Should the particle not be visible on the white of the eye, the lower lid must be pulled down, and its surface inspected. If not recognised in that position, the offending substance will probably be found on the inner surface of the upper lid, which structure must next be everted. If present it will be most likely seen as a small dark speck lying on the exposed conjunctiva. It must be taken away by means of a camel-hair brush or a bit of lint or cotton-wool damped with sterile water. The fragment, however, may lie on or even in the cornea, in which case cautious attempts to dislodge it may be made with the wool, but if the least difficulty be experienced, its removal must be left to a surgeon.

The instillation of a drop of a two per cent. solution of cocaine will render the proceedings above described painless to the patient, although holocaine or novocaine is even better for the purpose.

Examination of Troublesome Children.

From shyness, temper, pain, or other reasons, children often refuse to open their lids, so as to permit an examination of the eye. This difficulty can be sometimes overcome by a little coaxing on the part of the nurse, who is more likely to succeed when the child's mother or friends are out of the room. The production of a watch, a kitten, a

jingling bunch of keys, or some other attractive object, may induce the patient to open his eyes. But these homely devices sometimes fail, and we must then resort to other measures. The best plan may be thus briefly described.—Cotton-wool, lotions, and anything else likely to be required must be placed beforehand within easy reach. The nurse, having thrown a mackintosh sheet over her knees, seats herself in an ordinary chair, facing an assistant, who lays the child across her lap in such a way that his legs are held between her chest and her left arm, while his hands are grasped in her left hand. The patient is rendered helpless, and his head is steadied between the nurse's knees. It will be noticed that, while the assistant has her right hand at liberty to help the nurse, the latter has both hands free. The nurse will now be in a position to separate the lids, and to apply the necessary medicaments to the eye. In doing so, she should slide back the lids, as it were, over the globe, rather than pull them roughly apart, and anything like pressure must be most carefully avoided. The nearer the nurse's fingers are placed to the free edge of the lids, the easier will it be to expose the eye fully. Indeed, if that be not done, especially in a crying child, the lids will be everted instead of merely separated.

In specially difficult cases, the surgeon uses an instrument called a "retractor" (Figs. 10 and 69), by means of which the upper lid is raised, while the lower lid is pulled down by his fingers or by means of a second retractor. This little operation, however, is one that needs care, and is usually carried out by the doctor himself.

The lids of a sleeping child may often be opened and the eye examined before the child has time to awaken to a sense of his responsibilities.

Under certain circumstances, another plan may be adopted. The patient's face is plunged into a basin of cold water, and held there until the tips of the ears begin to show signs of blueness. Whatever be the explanation, the fact remains that the child will voluntarily open his eyes when released from his uncomfortable position, although sometimes, it is true, two or even three immersions, repeated at short intervals, may be necessary before that end is attained. The seeming roughness of this plan is, so far as I know, the only objection to its use. I may add that, personally, it has often rendered me good service.

Lastly, it is often necessary to give a general anæsthetic, as ethyl chloride, especially to children who dread the light much, as in some affections of the cornea, or in cases of ophthalmia neonatorum.

CHAPTER XIV.

DARK ROOMS.—DISINFECTION.

Dark Rooms.

The darkened room was formerly regarded as an indispensable agent in the treatment of many eye diseases. Nowadays, for various reasons, it has fallen into disuse, except after certain operations, and even in those it is being gradually replaced by other means. In a word, the darkened chamber, along with setons, blisters, poultices, eye-baths, and blood-letting, is rapidly becoming a thing of the past.

However, should darkness be deemed necessary in any given case, it may readily be obtained by drawing the blinds of an ordinary room. Another simple plan of cutting off the light is by pasting stout brown paper over the window-panes. Thick, heavy curtains, which are sometimes used for the purpose, are objectionable, because dust clings to them, and they soon become dirty. Other things being equal, a large is better than a small room, and a room at the top of the house better than any other.

Before occupation the room should be thoroughly cleansed, and unnecessary carpets, curtains, furniture, and valances taken away. A small bedstead should be provided, and placed in such a position as to afford access from every side. It should be scrubbed with 1 in 20 carbolic lotion before use. In a word, every

precaution ought to be taken to render the room as clean and as comfortable as possible.

A nurse must be careful that air, as well as light, be not excluded from the room. Every morning she should throw the windows widely open to air the chamber. A couple of windows, if possible on opposite sides of the room, should be kept permanently open for some inches at the top; or she may adopt the simple method of ventilation introduced by Hinckes-Bird, in which a piece of board is fitted between the sill and the lower sash of the window, and kept in that position. Fresh air is thus admitted into the room by the aperture left between the upper and the lower sash. The nurse should also take care that the chimney is not blocked up by old newspapers or other materials. Even in summer, when no fire is burning, the chimney acts as a useful ventilating shaft, while in winter, an enormous amount of vitiated air escapes by the same outlet.

As to temperature, the room should be kept at 60° F. in winter, and (if possible) at 50° to 55° F. in summer.

Wherever the rigorous confinement of the dark room may be safely relaxed, the nurse may shield the patient from direct glare by placing a screen between him and the window or even by simply using a large paper shade to cover his eyes. At a still later stage, the bedstead may be moved into such a position as to allow of the patient looking out of the window, a little luxury that is generally much appreciated.

Disinfection.

A room which has been occupied by a patient suffering from an infective disease of the eyes should be disinfected before it is used by other persons. This process may be carried out in the following simple way:—

The chimney-shaft is blocked up by means of old newspapers, windows are closed, ventilators are shut, key-holes are plugged, and all inlets for fresh air are sealed as far as possible by pasting strips of paper over them. Then an iron vessel is supported by a pair of opened tongs over a large bucket containing water, and this apparatus is placed in the middle[1] of the room. The iron vessel is next filled with pieces of roll sulphur,[2] over which some methylated spirit of wine is poured, and the spirit is ignited. The sulphur soon catches fire, and liberates a gas known as sulphurous acid, which possesses powerful antiseptic properties. As to quantity, the general rule is to use at least one pound of sulphur for every 100 feet of floor space. Thus, a room twenty feet long and fifteen feet wide contains 300 feet of floor space ($20 \times 15 = 300$), and would require three pounds of sulphur for its efficient aerial fumigation. Lastly, a wet towel is laid outside along the bottom of the closed door, so as to prevent unpleasant fumes from passing into the rest of the house.

[1] If the room be of large size, two receptacles may be needed. These should be placed at opposite ends of the chamber.

[2] Messrs. Seabury & Johnson manufacture a sulphur candle, which burns for two hours, the fumes from which are said to be sufficiently potent to disinfect a room of ordinary size. A somewhat similar article is sold by the Sanitas Company, Limited.

The room, filled with sulphurous acid, is kept shut up for at least eight hours, when doors and windows are thrown widely open to allow of thorough ventilation. A fire is lighted, and the chamber is left exposed to the purifying action of air and light for twenty-four hours. Thereafter, the floor is well scrubbed, all paint is washed, and the bedstead is cleansed with a one in twenty solution of carbolic acid. If necessary, the wall-paper is stripped off, and the ceiling white- or lime-washed.

In many public institutions, a steam disinfecting apparatus will be available for the purification of clothing and linen, but in private houses other means must be adopted. Towels, sheets, aprons, night-gowns, shirts, pillow-slips, in a word, all washable articles may be disinfected by immersing them in a one in twenty carbolic solution, or they may be steeped in boiling soda water for ten minutes. Blankets, pillows, mattresses, carpets, and curtains, on the other hand, should be purified by scattering them loosely about the floor before the sulphur is ignited, although a better plan is to suspend them from a rope stretched across the room. It must not be forgotten, however, that the fumes of burning sulphur are liable to bleach coloured fabrics.

During the last few years there has been a tendency to replace the old-fashioned sulphur fumigation by spraying all the contents of an infected room with formaline. Walls, ceiling, floors, and all articles of furniture are treated in this way.

CHAPTER XV.

HINTS ON SCHOOL INSPECTION.—REFRACTION CASES.—CASE RECORDS.

Hints on School Inspection.

School nurses are now very commonly appointed by Educational Authorities. Their duties are multifarious, but among them not the least important concerns the inspection and (under medical direction) the treatment of children's eyes. A school nurse should therefore possess a good working acquaintance with the commoner external diseases of the eye, described in Chapter XI. of this book.

In looking over the children, she should be seated with her back to a large window, so that a full light may fall upon the children's faces as they slowly defile before her. Any dread of light, or photophobia, as it is called, will be thus instantly detected. Squint or ptosis can hardly fail to be seen. Redness of the eyes will be equally obvious, and so will any notable amount of discharge. The commoner complaints she is likely to encounter are: blepharitis, styes, ulcers of the cornea, and the various forms of conjunctivitis, more especially the phlyctenular one, which is often accompanied by photophobia. Indeed, in children

nine times out of ten when the eyes dread light, phlyctenular disease is the underlying factor.

A nurse is often called upon to help a school medical officer in testing children's sight. She should therefore know the proper position to place the child with reference to the test-types, and how to occlude the eye that is not at the moment under examination. In the next section (see p. 190) she will find full particulars as to the way in which the acuteness of sight is expressed, and a little enquiry will show her how such details, when obtained, are to be entered upon the medical inspection record.

A school nurse should be familiar with the drawbacks of defective sight, so that she can explain to parents the use of spectacles and why a particular child requires them. She should understand why many a headache is really due to the eyes, although sight may be acute. Lastly, she should know how spectacles should be worn, and should be prepared to show a child how to put them on properly, how to keep them clean, and so forth (see "Spectacles," p. 176).

Among her other duties a school nurse should be well up in what may be called the "first aid" treatment of injured eyes. She should be capable of removing foreign bodies lodged upon the conjunctiva, to which end she will find hints in the section dealing with the "Removal of Foreign Bodies from the Eye" (see p. 180). She should be very circumspect in attempting to deal with foreign bodies in the cornea. At most, she should limit her intervention to attempt-

ing to remove them by the aid of a bit of perfectly clean twisted damp cotton wool. It is no part of her duty to employ any kind of instrument for the purpose. In difficult cases, a morsel of boric acid vaseline[1] should be introduced between the lids, the eye should be bandaged, and the child sent without delay to a medical man. In wounds of the eye a nurse should assume no responsibility and employ nothing beyond emergency treatment. Thus, she should cleanse the parts with great gentleness, using for the purpose warm boric lotion, put a little boric acid vaseline into the conjunctival sac, close the wounded eye with a pad and bandage, and send the child to a doctor for skilled examination and proper treatment. In dealing with burns of the eye, as from lime or chemicals, the most important immediate step is to wash the eye carefully out with plenty of warm boric lotion, and to remove any particles that may be seen. Boric acid vaseline is then put into the eye, which is bandaged, and medical aid is sought forthwith. Blows upon the eye may be productive of very serious damage. In such cases the sight of the injured eye may be roughly estimated, and after the eye has been bandaged, the child must at once seek medical assistance. A nurse can do little or nothing more under the circumstances.

Refraction Cases.

In some hospitals the sight is taken and recorded on the notes by a nurse before the surgeon sees the

[1] Boric acid, 10 grains; pure vaseline, 4 drachms.

patient. This is especially done in so-called "refraction cases"—that is to say, in patients whose complaints appear likely to be due to an error of refraction, as astigmatism or long- or short-sight. In such cases the eyes, as a rule, are not reddened, and the patients complain of bad sight, headache, tired or aching eyes, especially after work, and so forth. A very little experience in the out-patient department will enable a nurse to put such cases in a class apart from those whose eyes are obviously inflamed.

Under these circumstances the nurse must understand how she is to estimate and to record the distant sight, or visual acuity, as it is called. The test-types almost universally employed for this purpose are known as Snellen's, from the name of the famous Dutch ophthalmic surgeon who designed them. They are hung upon a wall at a distance of twenty feet (6 metres) from the patient, and to secure adequate and uniform illumination, they are usually lighted by electric or gas lamps. They include at least seven rows of letters of varying size. Each row has a small number placed above it, as follows, counting from the largest to the smallest letters: 60, 36, 24, 18, 12, 9, and 6. These figures indicate the distance at which a patient with normal sight should see a particular row. Thus, the largest letter (60) should be recognised by such a patient standing 60 metres away, and so on for the other numbers.

In estimating sight each eye is taken separately, the other eye being meantime excluded from vision by holding a card over it or in some other way.

The patient, seated 6 metres (or 20 feet) from the types, is told to read as many of the lines as he can. His sight is then recorded by a fraction, the numerator of which indicates his distance in metres from the test types and the denominator the number of the line he is able to read at that distance. For example, standing or sitting six metres from the type, the smallest line (6) is read, sight will then be recorded as $\frac{6}{6}$, or if the second smallest line be the smallest he can make out, sight is said to be $\frac{6}{9}$, and so on for the other lines. There are cases where patients are unable to read even the biggest letter from a distance of six metres. A common but rather slovenly way of recording this result is by the formula V $< \frac{6}{60}$, *i.e.*, less than $\frac{6}{60}$. A more accurate plan is to move the patient nearer to the types and to note the distance in metres at which he sees the biggest letter. The vision is then recorded as $\frac{5}{60}$, $\frac{4}{60}$, $\frac{3}{60}$, $\frac{2}{60}$, or $\frac{1}{60}$, according to the distance from the type at which he first recognises the letter. A patient, however, may be unable to see the biggest letter even when he stands only one metre (roughly, three feet) away from it. In that case we ascertain at what distance from his eye he can count the nurse's outspread fingers, and record the result as "fingers at so many inches". Below that again, we have the ability to tell light from dark, when the record would stand "perception of light," or as "P.L." for short. If the patient cannot tell day from night, then he is truly blind from a scientific point of view.

As a rule, a surgeon requires from a nurse a note

only of the visual acuity for distance, as explained above, but he sometimes wants to know the acuity for near objects as well. This is tested by placing the patient in a good light, and handing to him the hand type of Jaeger or Snellen, which is merely a cover containing various sized types, each numbered. Telling the patient to hold the types where he likes, we ascertain the number of the smallest print he is able to read, and the result is recorded as No. — J. or No. — Sn. as the case may be.

To recapitulate, the complete record in a given case might stand as follows: R.V. (*i.e.*, right vision) = $\frac{6}{6}$, and No. 1.J., and L.V. (*i.e.*, left vision) = $\frac{6}{6}$ and No. 1.J.

It is often necessary, under the surgeon's direction, to paralyse the accommodation in refraction cases, for which purpose a solution of homatropine and cocaine is usually employed. Its method of application has already been explained (see p. 55).

Case Records.

In hospitals, case-records, especially from the nursing standpoint, are usually kept by the sister of the ward. But in nursing homes and more particularly in private houses, a nurse is thrown upon her own responsibility, and so it may be advisable to give her a few hints as to the chief things she should take a note of. All the points, as a rule, can be entered upon an ordinary temperature chart, such as may be obtained from any chemist. They should be brief and to the point.

In the first place, the nature, hour, and date of operation should be entered upon the chart, which should have the patient's name, age, and address legibly written upon it. If a general anæsthetic, as chloroform, has been administered, a note should be made of the fact. Even in acute diseases of the eye, a rise in the bodily temperature is not very common. At the same time it may furnish the first hint of some complication, not necessarily affecting the eye. The temperature of the patient should therefore be recorded night and morning, as in ordinary medical and surgical cases. Furthermore, a nurse should invariably record the temperature before any operation on the eye. A single example may show the importance of this precautionary measure.—In a few cases, inflammation of the membranes of the brain (*meningitis*) has followed removal of an eye. It has been suggested that the meningitis was not due to the operation but that it was present before the latter was undertaken. Such a doubt would almost certainly be disposed of by a reference to a temperature record taken previously to the enucleation.

The state of the bowels should be recorded on the chart, and it is not a bad plan to note the pulse-rate night and morning when the temperature is taken. Any alteration of treatment should be recorded under its appropriate day. It is important to record the advent of pain, together with the exact time when it was first complained of. The presence of discharge from the eye should also be noted.

In brief, a nurse should be prepared to render an

account of the following points, no matter what the particular eye disease from which the patient suffers or the eye operation which he has undergone :—

(1) Temperature.
(2) Bowels.
(3) Pulse.
(4) Pain.
(5) Sleep.
(6) Appetite.
(7) Discharge.

APPENDIX I.

INSTRUMENTS NEEDED FOR THE PRINCIPAL OPERATIONS.

I. Operations upon the Appendages of the Eye.

1. Removal of Chalazion.

Small Scalpel.
Chalazion Forceps.
Small Sharp Spoon, or Tarsal Scoop. (Figure 49.)

2. Canthoplasty.

Strong Straight Blunt-pointed Scissors.
Dissecting Forceps.
Three Needles threaded with Sterilised silk.
Needle Holder. (Figs. 50 and 51.)

3. Operations on the Tear Passages.

Lacrymal Syringe. (Figure 55.)
Weber's Canaliculus Knife. (Figure 52.)
Set of Lacrymal Probes. (Figure 53.)
Stilling's Knife. (Figure 54.)
Small Scalpel.
Dissecting Forceps.
Nettleship's Lacrymal Dilator. (Figure 70.)
Needles and Sutures.
Müller's Retractor. (Figure 71.)
Axenfeld's Retractor. (Figure 72.)
Stephenson's Retractor. (Figure 73.)
Harman's Retractor. (Figure 74.)
Pressure Forceps. (Several pairs.)

4. Division of a Tendon for Squint.

Speculum. (Figure 40.)
Two Pairs of Fixation Forceps. (Figure 43.)
Straight Blunt-pointed Scissors. (Figure 46.)
Strabismus Hook. (Figure 47.)

5. Advancement for Squint.

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.)
Wecker's Double Hook (Figure 66) or Prince's Forceps. (Figure 67.)
Squint Hook. (Figure 47.)
Needle Holder. (Figs. 50 and 51.)
Threaded Needles.
Blunt-pointed Straight Scissors. (Figure 46.)

6. Entropion and Ectropion.

Scalpels.
Lid Forceps.
Dissecting Forceps.
Horn Spatula.
Needle Holder.
Needles.
Sutures.
Scissors.

II. Operations upon the Eyeball.

1. Corneal Section.

Speculum. (Figure 40.)
Graefe's Cataract Knife. (Figure 45.)
Vulcanite or Tortoiseshell Spatula. (Figure 44.)
Fixation Forceps. (Figure 43.)

2. Paracentesis.

Speculum. (Figure 40.)
Broad Needle (Figure 41) or Bowman's Stop Needle (Figure 42).
Fixation Forceps. (Figure 43.)
Spatula. (Figure 44.)

3. Tattooing the Cornea.

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.) (Not employed by some surgeons.)
Tattooing Needle.
Stick of Indian Ink.
Sterile Watch-glass.

4. Iridectomy.

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.)
Keratome. (Figs. 63 and 64.)
Graefe's Knife. (Figure 45.)
Iris Forceps. (Figure 59.)
Iris Scissors. (Figure 58.)
Spatula. (Figure 44.)

5. Trephining the Sclera for Glaucoma, also known as Elliot's Kerato-Sclerectomy.

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.)
Trephines, Stephenson's (Figure 75) or Elliot's (Figure 76).
Iris Forceps. (Figure 59.)
Iris Scissors. (Figure 58.)
Spatula. (Figure 44.)

6. Small Flap Operation for Glaucoma (Herbert).

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.)
Very Narrow Graefe Knife (Figure 45) or Sym's Iridectomy Knife.
Special small Knife for making the Lateral Incisions. (Figure 77.)

7. Extraction of Senile Cataract.

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.)
Graefe's Cataract Knife. (Figure 45.)
Iris Forceps. (Figure 59.)
Iris Scissors. (Figure 58.)
Cystitome. (Figure 60.)
Capsule Forceps. (Figure 78.)
Curette. (Figures 61 and 79.)
Cataract Scoop or Vectis. (Figure 62.)
Lid elevator.
Spatula. (Figure 44.)

8. Suction Operation for Cataract.

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.)
Keratome (Figs. 63 and 64) or Broad Needle (Figure 41).
Suction Syringe. (Figure 65.)
Spatula. (Figure 44.)

9. Solution Operation for Cataract.

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.)
Cataract Needle. (Figure 42.)

10. Curette Evacuation for Cataract.

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.)
Keratome. (Figure 64.)
Curette. (Figure 79.)
Spatula. (Figure 44.)

11. Enucleation of the Eye.

Speculum (Figure 40) or Retractors (Figures 10 and 69).
Fixation Forceps. (Figure 43.)
Strabismus Hook. (Figure 47.)
Straight Blunt-pointed Scissors. (Figure 46.)
Curved Blunt-pointed Scissors. (Figure 48.)
Note. — By many Surgeons Needles and Sutures and a Needle-holder are used.

12. Evisceration of the Eye.

Speculum. (Figure 40.)
Fixation Forceps. (Figure 43.)
Small Scalpel.
Mules's Scoop. (Figure 56.)
Straight Scissors. (Figure 46.)
Mules's Introducer. (Figure 57.)
Glass Spheres, the so-called "Artificial Vitreous".
Two pairs of Squint Hooks. (Figure 47.)
Three Threaded Needles.
Needle-holder. (Figs. 50 and 51.)
Small Sterile Pledgets of Absorbent Cotton fixed in Pressure Forceps or on glass rods.
Galvano- or Electro-Cautery.

13. Sclerotomy.

Instruments as for Iridectomy, with the exception of Keratome, Iris Scissors, and Iris Forceps, which are not required.

Note.—The foregoing list does not pretend to be exhaustive. The barest necessities only are given, and a nurse should remember that the surgeon may call for duplicates or for other instruments.

APPENDIX II.

ILLUSTRATIONS OF INSTRUMENTS.

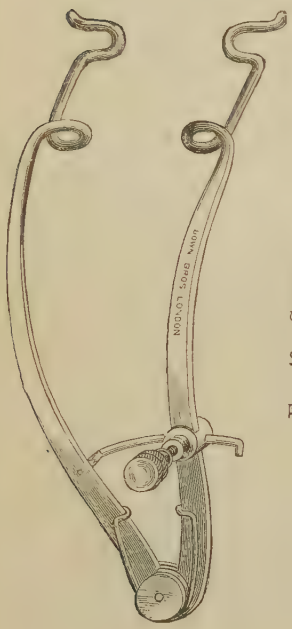

FIG. 40. SPECULUM.

FIG. 42. BOWMAN'S STOP NEEDLE.

FIG. 41. BROAD NEEDLE.

FIG. 44. SPATULA.

FIG. 45. GRAEFE'S CATARACT KNIFE.

FIG. 43. FIXATION FORCEPS.

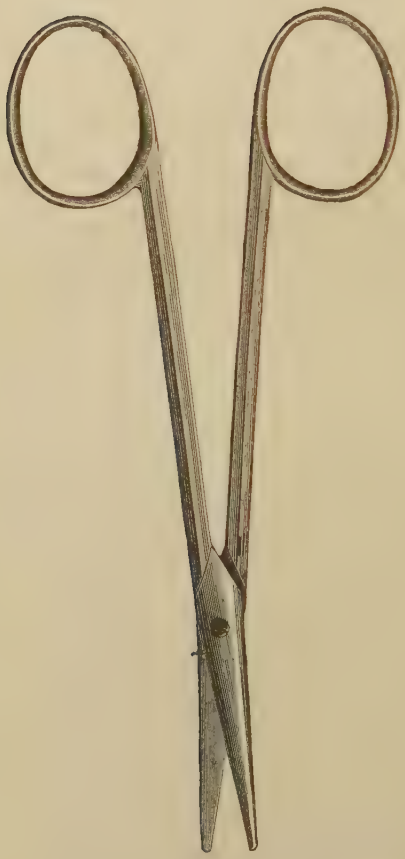

FIG. 46. BLUNT-POINTED SCISSORS.

FIG. 47. STRABISMUS HOOK.

FIG. 48. CURVED SCISSORS.

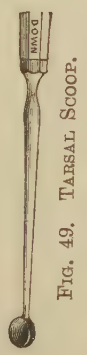

FIG. 49. TARSAL SCOOP.

FIG. 50. AMERICAN NEEDLE HOLDER.

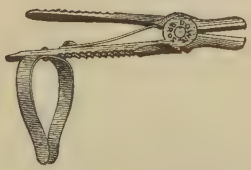

FIG. 51. GALEZOWSKI'S NEEDLE HOLDER.

FIG. 52. CANALICULUS KNIFE.

FIG. 53. BOWMAN'S LACRYMAL PROBES.

FIG. 54. STILLING'S STRICTURE KNIFE.

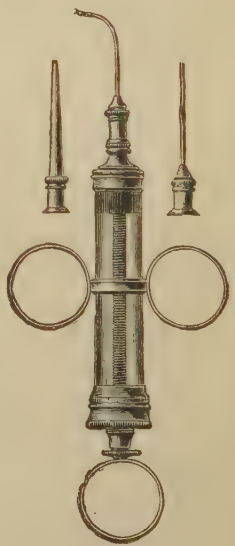

FIG. 55. LÜER'S LACRYMAL SYRINGE.

FIG. 56. MULES'S SCOOP.

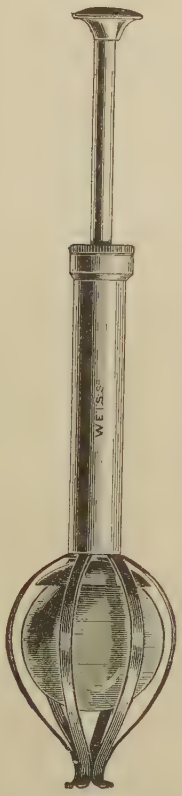

FIG. 57. MULES'S INTRODUCER WITH GLASS SPHERE IN PLACE.

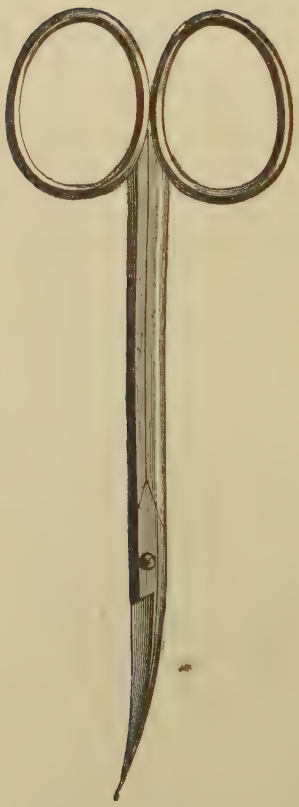

FIG. 58. IRIS SCISSORS.

FIG. 59. IRIS FORCEPS.

FIGS. 60 and 61. CYSTITOME AND CURETTE.

N.B.—These two instruments should be provided with separate handles.

FIG. 63. KERATOME (STRAIGHT).

FIG. 64. KERATOME (ANGULAR).

FIG. 62. VECTIS OR LENS SCOOP.

FIG. 65. TEALE'S SUCTION SYRINGE.

FIG. 66. WECKER'S DOUBLE HOOK FOR SQUINT.

FIG. 67. PRINCE'S FORCEPS FOR SQUINT.

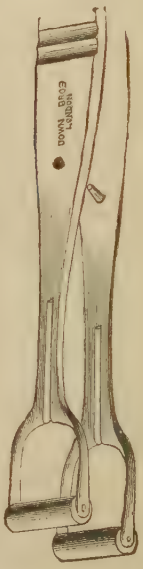

FIG. 68. ROLLER FORCEPS (modified by Author).

FIG. 69. AUTHOR'S RETRACTOR.

FIG. 70. NETTLESHIP'S LACRYMAL DILATOR.

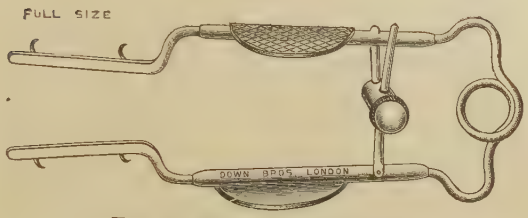

FIG. 71. MÜLLER'S RETRACTOR.

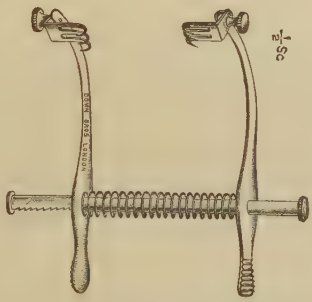

FIG. 72. AXENFELD'S RETRACTOR.

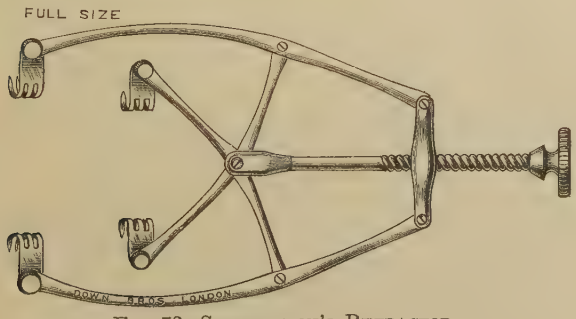

FIG. 73. STEPHENSON'S RETRACTOR.

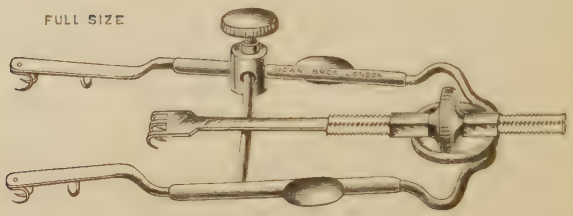

FIG. 74. HARMAN'S RETRACTOR.

FIG. 75. STEPHENSON'S TREPHINE.

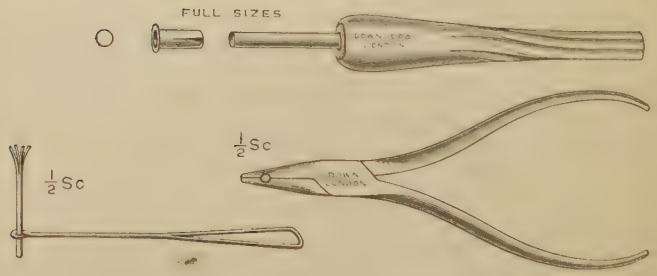

FIG. 76. ELLIOT'S TREPHINE.

FIG. 77. SMALL KNIFE USED IN HERBERT'S OPERATION.

FIG. 78. CAPSULE FORCEPS.

FIG. 79. CURETTE.

APPENDIX III

GLOSSARY.

Accommodation . The power possessed by the eye of adapting itself to sight at different distances by alterations in the shape of the crystalline lens.

Alkaloids . . . Certain active principles contained in plants which give to them their peculiar properties. Thus, morphine is one of the many alkaloids of the poppy.

Amaurosis . . . Blindness without external or ophthalmoscopic changes of the eye.

Amblyopia . . . Dulness of sight without external or ophthalmoscopic changes of the eye.

Anæsthesia . . . The local or general insensibility produced by anæsthetic agents.

Anæsthetics . . Agents, such as chloroform or cocaine, by means of which local or general insensibility is produced.

Anterior Chamber The space between cornea in front and iris and lens behind; it contains the aqueous humour.

Anthrax . . . . A fatal and contagious disease of man and of animals, due to the presence of a particular bacillus.

Antiseptic . . . Broadly speaking, anything that destroys micro-organisms or their spores.

Asepsis . . . . The state of being free from micro-organisms, their products, or spores.

Aqueous Humour The watery fluid contained in the anterior and posterior chambers of the eye.

Astigmatism . . An optical defect of the eye, in which rays of light, instead of focussing at a point, focus at a line. It may usually be corrected by proper glasses.

Atropine . . . . The active principle of the Deadly Nightshade (*Atropa Belladonna*), used in eye-surgery to dilate the pupil, and for other purposes.

Atropinism . . . A name for the unpleasant symptoms which sometimes follow the local use of atropine.

Bacillus . . . . A micro-organism of rod-like shape but of greater length than the bacterium.

Bacterium . . . A minute rod-shaped vegetable micro-organism.

Blennorrhœa . . A discharge of "matter" from a mucous membrane: both gonorrhœa and purulent ophthalmia are examples of blennorrhœa.

Blepharitis . . . Inflammation of the edge of the eyelid, marked by redness, formation of scales, or ulceration.

Blind Spot . . A name given to a part, insensitive to light, where the optic nerve enters the fundus of the eye.

Bulbar Conjunctiva . . . . . See "Conjunctiva".

Canaliculus . . . The hair-like passage leading from the edge of the lid into the lacrymal sac.

Canthus . . . . The name applied to the inner and outer corners of the eye.

Cataract . . . . An opaque condition of the crystalline lens of the eye.

Cellular Tissue . Tissue composed of cells and fibres, which connects various parts together, and serves as packing, as in the orbit.

Chalazion (Tarsal Tumour) A tumour of the eyelids, possibly due in the first instance to obstruction of a Meibomian gland.

Chemosis . . . Distension and swelling of the ocular conjunctiva.

Choroid . . . . The middle dark coat of the eye, reaching from the optic nerve to the front of the globe.

Ciliary Body . . One of the deeper structures of the eye, consisting of the ciliary processes and the ciliary muscle.

Ciliary Muscle . An internal muscle of the eye, concerned with accommodation. In action, the muscle draws forward the choroid coat, relaxes the suspensory ligament of the lens, thus allowing the latter structure to become more convex.

Ciliary Processes Some 60 to 70 projections lying on the inner surface of the choroid coat, and forming a circle beneath the ciliary muscle.

Cilium . . . . . An eyelash.

Cocaine . . . . An alkaloid obtained from the coca leaf, and used in eye-surgery chiefly on account of its anæsthetic properties.

Cocci . . . . . Micro-organisms having a spherical or an oval shape.

Collyrium . . . An eye-wash.

Compress . . . . A suitably shaped pad, wet or dry, applied over the eyeball.

Conjunctiva . . The delicate membrane which lines the eyelids (*palpebral conjunctiva*) and covers the front of the eyeball (*ocular conjunctiva*).

Conjunctivitis . Ophthalmia or inflammation of the conjunctiva.

Cornea . . . . The transparent front of the eye, measuring about $\frac{1}{15}$th of an inch in thickness, and forming $\frac{1}{6}$th of the external envelope of the globe.

Corneal Section . An operation performed for septic ulcers of the cornea, often, but incorrectly, known as "Saemisch's Section".

Corneitis (Keratitis) . . . . Inflammation of the cornea.

Counter-irritants Agents which produce inflammation, and which are applied at some distance from the seat of a malady, *e.g.*, a mustard leaf.

Crystalline Lens . The transparent solid body which separates the aqueous from the vitreous humour, and is the chief agent by which rays are brought to a focus on the retina. Its shape resembles that of a "burning-glass".

Cul-de-sac . . . The blind alley at the junction of the palpebral and ocular conjunctiva.

Diphtheria . . . An infectious disease, due to a specific organism; its essential symptoms being great prostration, and the formation of a false membrane in the throat or other part affected.

Diplo-coccus . . An organism which takes the shape of two minute round or oval cells joined together.

Diplopia . . . . Double sight.

Discission . . . An operation in which a needle is introduced into the eye in order to break up an opaque lens, and for other purposes.

Ectropion . . . A turning outwards of the eyelids, so that the conjunctiva is exposed.

Eczema . . . . Inflammation of the skin, dry or moist, often attended with the formation of scales.

Emmetropia . . That optical condition of the eyeball in which parallel rays of light are brought to a focus on the retina without exercise of accommodation.

Endemic . . . . A disease peculiar to a people or a district. Thus, goitre is endemic in Derbyshire.

Entropion . . . A turning inwards of the eyelids, so that the skin and lashes come into contact with the eye.

Epidemic . . . Any disease, attacking, it may be, large numbers of people. Scarlet fever is often epidemic, for instance, in London and other large towns.

Epilation of Eyelashes . . . . The operation of plucking out the eyelashes.

Epiphora . . . Overflow of tears.

Eserine (Physostigmine) The alkaloid of calabar bean, used in eye surgery to contract the pupil, and for other purposes.

Evisceration . . An operation in which all the parts of the eye, except the sclerotic, are removed.

Exenteration of Orbit Removal of all the contents of the orbit. Performed for malignant growths.

Expression . . . An operation by which the diseased material of a "granular eyelid" is squeezed out.

Eyebrow (Supercilium) The fringe of coarse hairs overhanging the orbit.

Fundus Oculi . . That part of the optic nerve, the retina, and the choroid, which can be seen when using the ophthalmoscope.

Fungus . . . . Broadly speaking, fungi are plants that reproduce their kind by means of spores. The term, however, is used in this book to mean micro-organisms.

Germicide . . . Germicides are agents which kill germs—that is, micro-organisms.

Glaucoma . . . A formidable disease characterised by increased hardness ("tension") of the globe. It may be acute or chronic, and in the latter case is usually painless.

Glioma . . . . A tumour affecting the retina of infants.

Globe . . . . . As used in this book, the term "globe" means the eyeball.

Gonococcus . . . The micro-organism which causes gonorrhœal ophthalmia and gonorrhœa.

Gonorrhœa . . . A contagious disease in which pus is discharged from the generative organs (male or female).

Granular Lids (Trachoma) A contagious disease of the conjunctiva, in which the lids become red, rough, and granular.

Hemeralopia . . Night blindness.

Hordeolum . . . A stye arising in connection with the glands of the edge of the eyelid.

Hyaloid Membrane A thin transparent membrane which encloses the vitreous humour.

Hypermetropia . An optical defect of the eye, which is too short from before backwards. "Long sight," as this condition is often called, may be relieved by suitable glasses.

Hyphæma . . . A collection of blood in the anterior chamber of the eye.

Hypopyon . . . A collection of pus in the anterior chamber of the eye.

Iridectomy . . . An operation by which a piece of the iris is cut away.

Iris . . . . . A muscular structure which gives its distinctive colour to the eye, and which is seen through the cornea.

Iritis . . . . . Inflammation of the iris.

Irradiation . . . A phenomenon due to defective accommodation.

Jequirity . . . . The seeds of *Abrus precatorius*, used to produce a kind of artificial ophthalmia for the cure of pannus and granular lids.

Keratitis . . . Inflammation of the cornea.

Lacrymal Duct . The canal leading from the lacrymal sac into the lower portion of the nose.

Lacrymal Gland . The gland which secrets tears.

Lacrymal Sac . The dilated bag which lies between canaliculi and nasal duct.

Leucoma . . . . A scar upon the cornea, the result of an ulcer.

Leucorrhœa . . A white discharge from the vagina.

Levator Palpebræ Superioris . . A muscle the function of which is to raise the upper lid. It is supplied with nervous energy by the third cranial nerve.

Linear Extraction A name given to the operation commonly used for the extraction of senile cataract.

Lippitudo . . . An unsightly appearance of the eyelids, due to neglected blepharitis.

Macula . . . . A scar left in the cornea after ulceration of that membrane.

Macula Lutea . . An oval area in the retina where sight is most acute. It measures about $\frac{1}{12}$th of an inch in diameter.

Madarosis . . . Baldness of the lid edges.

Meibomian Tumour See "Chalazion".

Meibomian Glands A series of small glands which lie embedded in the tarsus of the eyelids.

Meningitis . . . Inflammation of the membranes of the brain.

Mercurialism . . A term to express the unpleasant effects (salivation, soreness of the mouth, etc.) sometimes produced by the administration of mercury.

Micro-coccus . . See "Cocci".

Micro-organism . A minute living cell, to be recognised with a powerful microscope only. This term is now reserved for the vegetable fungi which cause fermentation, putrefaction, and many diseased processes.

Muco-purulent Ophthalmia An acute inflammation of the conjunctiva, characterised by discharge midway between mucus and pus.

Mucous Membrane A moist, soft membrane lining all the internal passages—*e.g.*, gullet, windpipe, bowel, etc. —and throwing off a fluid secretion known as mucus.

Mucus . . . . . The glairy substance thrown off by a mucous membrane.

Mules's Operation An operation in which the whole contents of the eyeball, except the sclerotic coat, are removed and replaced by a glass or metal sphere.

Mydriasis . . . Dilation of the pupil.

Mydriatic . . . An agent which dilates the pupil, *e.g.* atropine.

Myopia . . . . An optical defect of the eye, in which that organ is too long from before backwards, with the consequence that rays of light do not focus exactly upon the retina. Myopia, or "short sight" as it is called, can be relieved by suitable glasses.

Myosis . . . . Contraction of the pupil.

Myotic . . . . An agent which contracts the pupil, *e.g.*, physostigmine.

Nasal Duct . . . See "Lacrymal Duct".

Nebula . . . . An opacity of the cornea, due to ulceration of that structure.

Nictitation . . . The act of blinking the eyes.

Nyctalopia . . . Day blindness.

Nystagmus . . . An involuntary rolling of the eyeballs, generally a sign of bad sight.

Oblique Muscles . Two external muscles of the eyeball, superior and inferior.

Œdema . . . . A swelling due to effusion of lymph.

Oidium Lactis . The organism which turns milk sour.

Onyx . . . . . A fanciful term given to a collection of pus between the layers of the cornea. It is doubtful whether onyx ever exists apart from hypopyon.

Ophthalmia . . . A general term applied to all inflammations of the conjunctiva.

Ophthalmia Neonatorum A form of purulent ophthalmia which affects newly-born children, and is often due to a micro-organism, the gonococcus.

Ophthalmoscope . A mirror for examining the fundus of the eye.

Optic Disc . . . That part of the optic nerve visible with the ophthalmoscope.

Optic Nerve . . The nerve of sight which passes from the eye to the brain.

Orbit . . . . . The bony cavity in the skull which contains the eyeball.

Organism . . . A term applied in this book to the minute vegetable fungi, spoken of as bacteria, cocci, etc.

Orbicularis Muscle A muscle, the function of which is to close the eyelids. It derives its nerve-force from the facial nerve.

Pannus . . . . A complication of trachoma, really trachoma of the cornea.

Paracentesis . . The operation of opening the anterior chamber of the eye.

Parasites . . . Organisms which derive their nourishment from the body or tissue of a host; in the narrower sense of the word, certain micro-organisms which live at the expense of the human body.

Phagocytosis . . A power possessed by the white blood corpuscles of attacking and destroying the germs of disease.

Phlyctenular Conjunctivitis A form of disease in which phlyctenules appear upon the white of the eye.

Phlyctenule . . The red pimples met with in phlyctenular conjunctivitis.

Physostigmine . See "Eserine".

Posterior Chamber A small space lying behind the iris and containing aqueous humour. It is bounded behind by the suspensory ligament of the lens, and at the outer side by the ciliary processes.

Presbyopia . . . A defect of accommodation, natural to the eye, making its effects felt at about the forty-fifth year, and due to diminished elasticity of the crystalline lens.

Ptomaines (Toxines) The products of micro-organisms, similar in many respects to the alkaloids of plants.

Ptosis . . . . . A falling of the upper lid, congenital, or due to paralysis of the third cranial nerve.

Punctum Lacrymale	The pin-point opening of the canaliculus.
Purulent Ophthalmia	A severe form of inflammation of the conjunctiva, accompanied by the discharge of pus from that membrane. Always due to contagion.
Pus	The familiar yellow product of inflammation known as "matter".
Reactionary Hæmorrhage	The bleeding which sometimes occurs within twenty-four hours after a wound, either accidental or operative.
Recti Muscles .	The four straight external muscles of the eye.
Retina	The delicate inner coat of the eye, placed between the choroid and the vitreous humour.
Rods and Cones .	One of the layers of the retina closely concerned with sight.
Saprophytes . .	Organisms that exist only in dead matter, for example, pus.
Scarification . .	A method of drawing blood by numerous small incisions.
Sclerotic (Sclera)	The firm white outer coat of the eyeball, which forms $\frac{5}{6}$ths of the globe, the rest ($\frac{1}{6}$th) being formed by the cornea.
Sclerotomy . . .	An operation for the relief of glaucoma.
Scrofula (Struma)	A peculiar constitution characterised by tendency to chronic inflammation of skin, glands, joints, bones, conjunctiva, and other tissues. Formerly known as the "King's Evil". Most of its manifestations are now regarded as evidences of tubercle.
Septic	Applied to micro-organisms, this term means those which produce diseased conditions in the human body.
Seton	A thread kept beneath the skin in order to excite inflammation.
Serpiginous Ulcer	A serious form of ulcer of the cornea, attacking old broken-down people, and due to micro-organisms.
Spirillum . . .	A corkscrew-like micro-organism. Relapsing fever is caused by a spirillum.
Spirochaeta pallida	A tiny organism known to be the cause of Syphilis.
Spores	The minute cells, by means of which micro-organisms reproduce their kind.
Staphylococci .	Cocci arranged in regular masses.
Staphyloma . .	A protrusion of some part of the coats of the eye.

Sterilise	To render free from germs and their spores. Thus, water which has been boiled is said to be sterilised.
Strabismus	The Latin name for Squint.
Strabotomy	A barbarous term sometimes used to indicate the division of a tendon for the cure of squint.
Strepto-cocci	Cocci arranged in rows like the pearls of a necklace.
Suction Operation	An operation in which a softened cataract is sucked out of the eye.
Supercilium	The eyebrow.
Suspensory Ligament	A number of fine radiating fibres stretching between the lens in front and the ciliary processes behind.
Symblepharon	A condition in which the palpebral and the bulbar conjunctiva become adherent to each other; it sometimes follows burns and other injuries of the eye.
Syphilis	A constitutional affection which may be hereditary or acquired. It may be conveyed in many ways. It is caused by an organism known as the Spirochæta pallida.
Tenotomy	Division of a tendon.
Tinea Tarsi	See "Blepharitis".
Toxines	See "Ptomaines".
Trachoma	See "Granular Lids".
Trichiasis	A condition in which the eyelashes are wrongly directed, thus coming into contact with the globe.
Tubercle	An inflammatory nodule caused by the irritation of the tubercle bacillus.
Uvea	The pigmented parts of the iris, choroid, and retina.
Vibrio	A micro-organism resembling the spirillum.
Vibrissæ	Long sensitive hairs common in the lower animals, and sometimes developed in the eyebrows of old people.
Virus	Speaking generally, an animal poison. For instance, the virus of hydrophobia.
Vitreous Humour	The transparent jelly-like material which is contained in the vitreous chamber of the eye, and which supports the retina.
Vitreous Chamber	The cavity which contains the vitreous humour.
Yellow Spot	See "Macula Lutea".
Zonule of Zinn	See "Suspensory Ligament".

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